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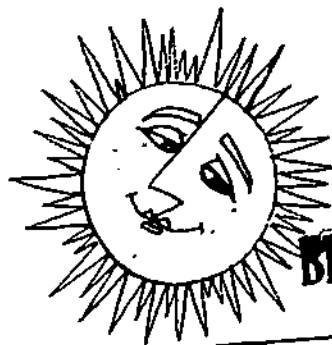
ABSTRACT

This publication represents the state model for environmental education curriculum for kindergarten through grade twelve in Delaware's schools. The document defines environmental education, lists major curriculum objectives and guidelines, and stresses the importance of the interdisciplinary approach. Four model units, representing the grade level blocks K-3, 4-6, 7-9 and 10-12, have been expanded to demonstrate the conversion of objectives into a program of student learning experiences. Each expansion includes: global objectives, instructional objectives and suggested activities for the instructional objective. The model is organized around six major global objectives dealing with energy sources, earth resources, resource reclamation, population dynamics, interdependence and quality of life. Following each global objective is a series of instructional objectives for use in the development of local programs. For each instructional objective, the grade level and subject areas into which it may be infused have been suggested. A bibliography concludes this publication. (BT)

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A MODEL FOR THE ENVIRONMENTAL
EDUCATION CURRICULUM FOR KINDERGARTEN
THROUGH GRADE TWELVE IN DELAWARE'S SCHOOLS

SE019 380

EQUINOX

**A MODEL FOR THE ENVIRONMENTAL
EDUCATION CURRICULUM FOR KINDERGARTEN
THROUGH GRADE TWELVE IN
DELAWARE'S SCHOOLS**

Prepared by

The Delaware State Department of Public Instruction

in cooperation with the Del Mod System

January 1, 1975

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ARTWORK & LAYOUT

Thomas M. Baker

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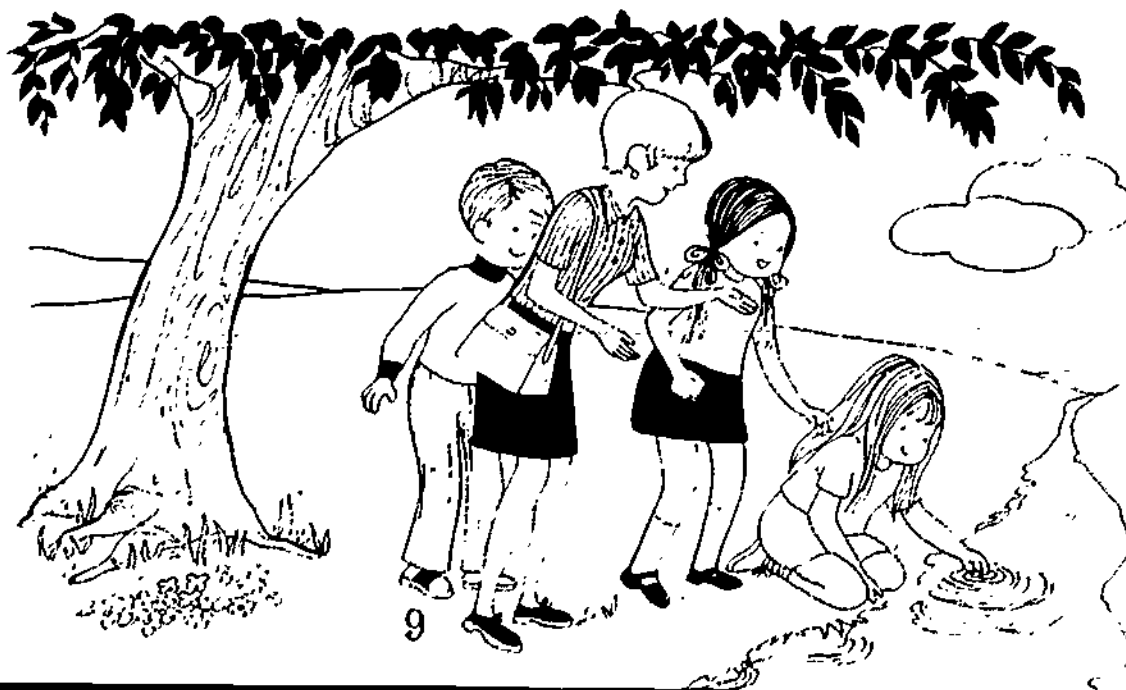
WHAT IS IT?

The study of the environment has long been an interesting and exciting area. Unfortunately, it has been enjoyed by too few and the scope of environmental education has been very limited. Conservation has been the major thrust in environmental education.

Environmental education, however, should be concerned with more than surface facts on conservation. It should be concerned with involving people in environmental problem solving. There should be no claim for environmental education to create naturalists. Many students involved in an environmental education program would undoubtedly become interested in nature, but this should be a secondary rather than primary aim of a program.

Environmental education programs must be interdisciplinary, incorporating material from ecology, biology, chemistry, physics, geography earth science, social sciences, political sciences, reading, art, mathematics, and music. An understanding of the social aspects of the environment may be developed through the study of the findings of psychology, sociology, history, economics, and other areas of the social sciences. It is important for students to develop restraint, concern, and a value system that encourages positive action to improve the environment.

A stimulating teaching philosophy should underlie all environmental education programs. John Klines has identified several guidelines for involving students in the study of the environment in his article, *Education and Our Environmental Crisis* ("Science and Children", March, 1970). First, teaching should be accomplished with a sense of wonder and discovery. Second, students must understand that there is nothing mysterious about the ecological point of view. Third, students need to become aware of and to appreciate the great diversity found in our environment.



THE ENVIRONMENTAL CURRICULUM

Training concerned citizens who can contribute to improving environmental quality should be a major function of Delaware's schools. It is especially important that the problems of environmental ignorance and insensitivity are confronted during a student's school career.

CURRICULUM OBJECTIVES

The following are the three major objectives that should be the basis of any environmental education program.

1. *To help students acquire an understanding of the biophysical environment and society's relation to it.*

This understanding should include knowledge of the characteristics, distribution, interrelations, and uses of natural resources.

2. *To encourage understanding of human beings as an inseparable part of the environment but with the ability to alter it in many ways through activity or lack of it.*

Most important is a person's interaction with the environment to advance human welfare.

3. *To understand the methods, strategies, and social arrangements through which people interact with the environment.*

Such an understanding results from the study of various political, legal, managerial, technical, and educational means by which people interact with the environment and plan their environmental future.

In order to meet the above objectives, the environmental curriculum should be designed carefully and need not be a separate entity. The State Department of Public Instruction recommends that environmental education should be an integral part of all natural and social science instruction in Delaware's schools.

CURRICULUM GUIDELINES

In the development of any form of an environmental education program the following guidelines should be observed.

Environmental education programs should be developed in accordance with children's developmental stages.

The preoperational, concrete-operations and formal-operations stages posited by Piaget might serve as reference points. Experiences should be designed to facilitate a child's perception of his world through use of the senses.

The curriculum design should incorporate concepts and processes from the natural and social sciences.

Teaching basic principles of ecology is not enough. Students should be able to appreciate their environment and develop values that will guide positive action.

The main focus of a curriculum should be recognition of human's interdependence with both the natural and human made parts of the environment.

Students should be able to see themselves as part of the whole rather than an individual. The individual is important in solving environmental problems, but society as a whole must work toward more complete solutions.

Environmental education should be an integral component of the science curriculum and not just "tacked on" to look good.

As stated before this is an extremely important concept. Previously, most environmental education programs have been limited primarily to "conservation education" or "outdoor education". Although this type of activity does have merit, it all too often is stratified outside of the curriculum and has little relation to it.

Appropriate emphasis should be given to the study of natural, social, and human made environments, especially their interrelations.

The natural environment comprises the biotic and abiotic world, the social environment is the network of the relations among people, and the human made environments consist of people's modifications or structuring of the physical environment. Too often we have failed to help students understand the interrelations among these three and have taught instead only a limited conception of the natural environment.

The process of inquiry should be a prime vehicle for involving pupils in environmental education studies.

All too often the activities in classrooms consist of paper and pencil exercises that may or may not be relevant. Students need to be involved in "hands-on" experiences that give them a chance to learn by doing. The school, school ground, and the total community should become a total learning experience.

Appropriate attention should be given to cognitive, affective and psychomotor achievement.

If one domain should be stressed it should be the oft-neglected affective domain. Students need to develop a system of value analysis that will give them a broad base for making positive decisions concerning the environment.

INTERDISCIPLINARY APPROACH

The environmental problems with which we must deal are not simply technical or social. Environmental education by nature is an interdisciplinary study. The fulfillment of any objectives in an environmental education program require that ideas from many disciplines be incorporated into the curriculum.

ENVIRONMENTAL LEARNING OPPORTUNITIES KEYS TO AN EFFECTIVE CURRICULUM

Consider carefully each of the environmental problems and then construct notes on local examples of these problems of interest and concern to students at each grade level.

1. **Green Belts, Natural Areas, Leisure and Recreation.**
What groups are competing for use of local land areas? What are some needs which exist for Green Belts in your area?
2. **Wildlife Resources, Ecological Cycles and Chemicals.**
What are some of the values and details of local plant-animal-energy cycles which could appropriately be used at your school level? How is the problem of recycling natural resources handled in your community? What chemicals which interfere with these cycles are commonly released in your community?
3. **Population Control-Family Planning-Food Supply.**
What will be some of the effects of population growth on your community? What mathematical examples can be developed at an appropriate school level? What are natural mechanisms for regulating population size? What programs exist in the local community?
4. **Ecological Problems in an Urban Environment.**
What are the effects of long-and-short-range planning? What land-use conflict examples can be cited? How can or have some of these conflicts been resolved?
5. **Solid Waste Disposal.**
What alternative solutions have been proposed in the local community? What recycling efforts have been developed?
6. **Sanitary Wastes and Water Quality Control.**
What are some of the problems associated with water quality control in the local community? How has water quality been controlled? How have the local groups been involved? What aesthetic, social, political and economic factors have been involved?
7. **Air Quality Control.**
What are the factors in air quality and needs for control in your community? What human values are involved? How can students measure different aspects of air quality?
8. **Transportation and Land-Use Conflicts.**
What conflicts exist locally between transportation means and life style and limitation resources? What attitudes are involved locally concerning private versus mass transportation?

9. Communication, Noise, Advertising and Quality of Life.

How do local and metropolitan area stimuli affect the quality of life in your local community? What behavioral changes are prompted by the printed and electronic media?

10. Power Consumption and Distribution and Ecological Problems.

How is the local power generated and where? What local groups are concerned with making these decisions? What environmental conflicts exist over power generation and power use?

MODEL ENVIRONMENTAL EDUCATION UNITS

When only objectives are provided, teachers sometimes have difficulty converting them into a program of student learning experiences. As a starting point, four model units have been expanded by suggesting one or more learning activities and related teaching aids for each objective.

One unit has been expanded for each of the grade level blocks used in classifying the objectives in the next section, i.e., K-3, 4-6, 7-9 and 10-12.

In each of these units, one of the global objectives has been chosen and a series of instructional objectives selected. The suggested activities for students are designed to lead them to the behavior stated in the objective.

Student progress can be measured by asking the students (orally or in writing) to perform as specified by the objective. When students are unable to achieve the objective, the teacher should design a series of additional activities.

This procedure, of selecting global objectives, instructional objectives, designing activities, on-going evaluation and modification of the activities based on the evaluation, is highly recommended.

Obviously, many exciting things will happen during the environmental encounters which go beyond the objectives. Hopefully, students will get so involved in experiences that their attitudes towards the environment will improve. Other affective and cognitive developments may also take place during the experiences.

These suggested units emphasize the progress of learning from student fact gathering to the resolution of real community issues. They offer students an opportunity to make decisions based upon information and feelings required during relevant environmental studies. Remember, these are only suggested units. Teachers and school districts should feel free to add, subtract and substitute activities, as well as objectives, as they strive to implement an environmental education curriculum that is meaningful locally.

1. A K-3 MODEL UNIT

Global Objective E. The student will demonstrate an appreciation for the interdependence of living things in the closed earth system. *Instructional Objective 1.* Provided with the necessary activities, data and information, the student will describe how people in the community are dependent upon other communities for food, clothing and shelter, e.g., consider grassland communities, oceanside communities, forest communities.

Suggested activities:

- A. Have students trace the goods used in a single school lunch to communities where they were grown.
- B. Have students collect pictures of traced foodstuffs while they are growing and/or being processed. If the source or a processing plant is close by, take students there on a field trip and have them take their own pictures.

- C. Have students interview people who raise or process the foods and ask questions about their processes. Note: A similar set of activities could be developed for the clothes the students are wearing, the houses they live in, the water they drink, the products they use in any one day, etc.
- D. Have students imagine what their room would be like if all the products from a given resource were removed, i.e., forests, water, iron ore, clay, etc.

Instructional Objective 2. Provided with — the student will describe ways in which human's presence in his community has produced changes from its original natural state. (Construction of roads, bridges, houses, businesses, factories, etc.)

Suggested activities:

- A. After taking a walking tour through their community, have students develop a map of their neighborhood and locate predominant natural features on the map (rivers, lakes, hills). On the map draw in the predominant features that are human-made (roads, bridges, railroads, houses, businesses, factories). On the map have the students identify their own homes.
- B. Have students classify human-made features on the basis of function, such as those for transportation, shelter, food distribution, utilities, recreation, etc. Have students imagine how their community would have looked before the human-made features appeared. Have them draw pictures of how the school or some other area looked at that time.
- C. Have a long-time resident of the community visit the class and describe how the community looked when that person was a student. Students may be able to identify changes that developed during that individual's lifetime.
- D. In addition to the visual changes identified in the above activities, students might close their eyes and identify sounds or odors that are human-made and sounds or odors in their community that are natural.

Instructional Objective 3. Provided with --- the students will learn to recognize some animals by name through pictures and deduct from a picture of a set of animal tracks where it came from and what it might have done.

Suggested activities:

- A. Using a set of film strips or picture collections of both common, domestic animals and native, wild animals, the student should become familiar with the animals. The teacher should, whenever possible, substitute experiences with live animals for vicarious experiences. Trips to farms, zoos, etc., or the bringing of small animals into the classroom, should be encouraged. (Remember, animals may include insects, reptiles, birds, etc.)
- B. The class might develop a collection of plaster casts of animal footprints. Students could match the animal footprints with the picture and name of the animal.
- C. After a rain shower or new snow fall, the students might take a walk in the community and look for animal tracks, tracing where the animal came from and where it went. They could also construct an inference of what type of animal it was and what it did. (The sets we would find in an urban area would not be the same as those we might find in a rural or suburban area.)
- D. Students might draw sketches of the tracks they found and write a creative story about the animal.
- E. Student tracks might be followed, also, and similar inferences constructed. Children could follow the human footprints made on fresh snow or in some mud, if the footprints had some unusual or readily identifiable characteristics.

2. A 4-6 MODEL UNIT.

Global Objective B. When faced with decisions concerning the use of earth resources, the student will select practices developed in recognition of present and future environmental needs.

Instructional Objective 1. Provided with — the student will select a local stream, pond or lake and map the area draining into it.

Suggested activities:

- A. Define the term "watershed".
- B. Have students locate on a map the sources of water for their community.
- C. Take a field trip to a given area within the watershed and have students locate this area on the map.
- D. Discuss drainage patterns noted during rain.

Instructional Objective 2. Provided with — the student will explain the courses of water for the local watershed.

Suggested activities:

- A. Have the students explain in a class play how the water cycle benefits the watershed.
- B. List the various kinds of precipitation which supply water to the shed, i.e., rain, snow, sleet, etc.
- C. Explain how human's manipulation of the environment has affected the source and quality of water supply for watersheds, i.e., compare the runoff from a paved area or large building to a grassy or natural area of the same size.

Instructional Objective 3. Discuss the natural and human-made problems of the local watershed.

Suggested activities:

- A. Photograph or draw pictures of environmental problems discovered during a field trip.
- B. Write a story which describes how the life of a frog is affected by pollution.
- C. Role play a citizen living in this community in the year 2000.
 - 1. What will that individual use for water if this watershed continues to be contaminated?
 - 2. What are some reactional activities now available which may be unavailable at that time?
 - 3. If the water here is unusable, where in this solar system might people be able to go to find a usable source?

Instructional Objective 4. Provided with — the student will construct a series of food chains within the watershed and explain their importance for insuring a quality water supply.

- A. Ask students to respond to the following questions:

1. What is a food chain?
 2. How do these food chains benefit you?
 3. Can we do without them?
- B. Visit the school library and local watershed to gather data and collect specimens for determining food chains.**
1. Use the data and specimens collected to construct a series of chains.
 2. Explain what would happen to the local watershed if one or more food chains were disrupted.
 3. Write a short story depicting life in your community in the year 1990, after man has destroyed all food chains within the local watershed.
- C. Ask the students to prepare a panel debate, class play, mock television program or multi-media program depicting how destruction of the local water supply food chains affects the quality of life for them and their community.**
1. Photograph damages already evident.
 2. Tape interviews with local authorities and citizens.
 3. Compile a list of questions which students and citizens have about their watershed.

Instructional Objective 5. Provided with — the student will compare plant and animal watershed life in the winter months to life in the spring.

Suggested activities:

- A. Take a field trip to a chosen area and observe it during different seasons.**
1. List forms of life found in warm seasons as compared to forms observable in winter.
 2. Have students make inferences about what happens to different life forms during the winter.
 - a. Where have the birds gone?
 - b. What happens to frogs during the winter?
 - c. If we take a chunk of ice back to the classroom and melt it, do you think we may see different kinds of life?
 - d. If animals are living in the pond during the winter, how do they survive?
- B. Have the students write and implement a class play which tells the story of a pond community's struggle for a balanced environment.**

Instructional Objective 6. Provided with — the student will explain how a heavy rain affects the soil, plants, animals and people in or around the watershed, i.e., fertilizers, pesticides, insecticides, oil, salt, and sewage are often washed into the local watershed.

Suggested activities:

- A. Go outside during a rain and have students take notes on observations made.
- B. Visit the local sewage treatment facility and ask what happens to sewage during a heavy rain.
- C. Trace the runoff from a service station, farm or factory during or after a heavy rain.
 - 1. What pollutants do you think were here before the rain?
 - 2. Where did they go?
 - 3. What effect do they have on the local water supply?
 - 4. What suggestions do you have to improve this environmental problem?
 - 5. Can we afford to continue these practices?
 - 6. Are laws sufficient — are they being enforced? etc.

Instructional Objective 7. Provided with — the student will draw a map tracing water supplies from the school to its source.

- A. Ask the county surveyor or city engineer for a drainage map.
 - 1. Locate the school on the map.
 - 2. Draw a map which shows how water reaches the school.
 - 3. On the map, indicate where runoff water and sewage go after it leaves the school.
- B. Have students follow their map to the point where the runoff water and sewage is discharged.
- C. Have them list the advantages and disadvantages of the present system.

Instructional Objective 8. Provided with — the student will explain how the local water supply is treated and how this treatment affects the health, economics and recreation potential of the community.

Suggested activities:

A. Ask the county sanitarian for information about the local water supply.

1. What are the problems?
2. What are projected needs?
3. Is the water treatment expensive?

B. Photograph or collect pictures which demonstrate how water is used in his community.

1. In what ways is water being misused?
2. What suggestions do you have for reducing consumption of water?

C. Survey the school to determine how wisely water is being used.

1. Develop a water use plan for the school.
2. Develop a water use plan for the student's home.

Instructional Objective 9. Provided with --- the student will construct several food chains from collections made at the watershed.

Suggested activities:

A. Use dip nets and let students collect live specimens. Locate a safe place for students to collect them.

B. Place specimens in collecting pans so students can make observations.

1. In what ways is each animal adapted for living in the water?
2. Where do you seem to be finding most life? Why?
3. Why can't you see all forms of life?
4. Why should we take samples of the water back to the classroom?

C. Take microscopic specimens back to school and allow the students to observe them under a microscope, bioscope, etc.

1. Why did we bring these specimens back to school?
2. What can we learn from this study?
3. Why is small life just as important as large life?

Instructional Objective 10. Provided with --- the student will write a creative story, poem or play which explains the value of food chains to an adequate water supply.

Suggested activities:

A. Assign to each student one animal or plant in the watershed and have him prepare a report which explains its importance.

1. What is its function in or near the water?
2. What would happen to the water without this plant or animal?
3. What does it do for man?
4. What does man do for it?

B. Predict the consequences of a factory or housing project constructed near the water supply.

1. In what ways will this affect the water?
2. What are the environmental decisions which must be made to prevent destruction of the ecosystem?

Instructional Objective 11. Provided with — the student will write a description of the watershed.

Suggested activities:

A. Have the students take various measurements of the watershed.

1. What is the temperature of the water?
2. What biological forms does the river or stream have?
3. How much sediment is there in the water?
4. How many human-made disturbances are there?

Instructional Objective 12. Provided with — the student will deduce from the above studies a number of probable causes for watershed degradation.

Suggested activities:

A. Have the student preview filmstrips and films and study in textbooks and other materials the factors relating to stream degradation.

1. Have a representative from the Soil Conservation Service speak on the types of soils along the watershed.
2. Ask a member of the local planning board to speak on activities along the river.
3. Interview an older citizen of the community and record that person's description of the watershed thirty years ago.

4. Locate old and recent newspaper articles which describe the watershed's past and present use and misuse.

Instructional Objective 13. Provided with — the student will develop a plan for improving the watershed.

Suggested activities:

- A. Discuss possibilities of what has been learned into a workable plan of action such as:
 1. banks to hinder erosion.
 2. letters to government, industry, etc.
 3. a plan of action to implement.
- B. Have the student develop an Ecological Water Use Plan for his life.

3. A 7-9 MODEL UNIT

Global Objective F. The student will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short-and long-term benefits for onesself, society and the environment.

Instructional Objective 1. Provided with — the student will calculate the water yield and water consumption for the county where the school is and relate these calculations to projected water needs.

Some suggested activities:

- A. Have students secure data from which they can plot and calculate the average local annual rainfall for the past few years. Suggested sources: local weather station records, U.S. Weather Service, newspapers, unofficial local sources, etc.
- B. Have students obtain the official area of the county and calculate the amount of water falling on the county annually.
- C. Have students collect and process data from which they can calculate or approximate the annual water consumption within the county.
- D. Have students classify various types of water usages in the county.
- E. Have students interview local governmental, institutional and business authorities to determine projected changes in water needs for the county.

- F. Have students extrapolate their graphs and/or other sources of information to predict any projected change in local rainfall.
- G. Have students analyze water sources used in the county to locate non-local precipitation supplies of water and estimate the effects that changing upstream environments may have on these supplies.
- H. Have students write papers, prepare speeches, develop A-V presentations, etc., to report conclusions that they have reached concerning the present local water supply and needs.
- I. Have students classify local water uses as to the water purity needs.

Instructional Objective 2. Provided — the student will compare the quality of local surface water with rain water.

- A. Have students collect samples of surface water (including water from streams and impounded supplies) at various times (immediately after a shower, immediately after a downpour, after a drought, etc.) and analyze these samples for chemical and biological impurities.
- B. Have students collect samples of rain water at various local sites and compare purities.
- C. Have students compare the purity of surface water collected at a given site with that of the rain water sample collected nearby.
- D. Have students infer causes of differences in the purity of rainwater and surface samples.
- E. Have students devise and implement a plan to test their inferences.
- F. After having validated a cause of localized water pollution, have the student suggest adverse and beneficial environmental effects of the pollution by answering questions such as:
 - 1. Was the pollution source natural or human-made?
 - 2. Does the pollutant help remove another pollutant from the water? Is this beneficial or not?
 - 3. Does the pollutant provide nutrients for water life? If so, will this source of pollution cause an overpopulation of some species of water life?
 - 4. If the pollutant had been reclaimed at the source, are there more advantageous uses for it?

4. A 10-12 MODEL UNIT

Global Objective C. The student will voluntarily participate in programs involving resource reclamation.

Instructional Objective 1. Provided with --- the student will list types and amounts of solid waste on the school site (in the community).

Suggested activities:

- A. Tour the area, take pictures and list types of solid waste observed, map the locations with transparencies.
- B. Set up a control test area for litter.
- C. How much waste does the school produce daily?

Instructional Objective 2. Provided with --- the student will list sources of solid wastes and how they are disposed of.

Suggested activities:

- A. Trace the school waste.
- B. Describe various present disposal methods.
- C. Why were these methods selected?
- D. List solid waste, found in the area.

Instructional Objective 3. Provided with --- the student will describe the effect solid waste has on man's social, psychological and physical needs.

Suggested activities:

- A. Consult town reports.
- B. How much does solid waste disposal cost?
- C. Interview various people, such as town manager, maintenance men, dump caretakers, etc., to determine costs, problems, etc.

Instructional Objective 4. Provided with --- the student will identify and list federal, state and municipal laws governing the disposal of solid wastes.

Suggested activities:

- A. List federal, state and municipal laws governing solid waste disposal.
- B. Do they meet present day needs?
- C. Which ones are obsolete? Why?

Instructional Objective 5. Provided with --- the student will list authorities responsible for solid waste disposal.

Suggested activities:

Develop an organizational chart.

Instructional Objective 6. Provided with --- the student will list acceptable methods of solid waste disposal applicable to the area.

Suggested activity:

Invite guest speakers such as a soil conservationist, sanitary engineer, town manager, town planner, etc.

Instructional Objective 7. Provided with --- the student will select a method to resolve a solid waste problem, if one exists, on the school site.

Suggested activity:

Conduct a class discussion of alternatives.

Instructional Objective 8. Provided with --- the student will design a plan of action.

Suggested activity:

Consideration of school solid waste policy, delegation of duties, time schedules, etc.

Instructional Objective 9. Provided with --- the student will carry out a plan of action.

Suggested activity:

Implement the solid waste disposal policy.

Instructional Objective 10. Provided with — the student will analyze results of the action.

Suggested activity:

- A. What was the reaction to the solution to the problem?
- B. What further measures are necessary?

ENVIRONMENTAL EDUCATION INSTRUCTIONAL OBJECTIVES

Learning activities can be organized most effectively by carefully describing a sequence of observable and measurable behavioral changes which are indicators that desired steps in the learning process have occurred. Although specific instructional objectives aid the teacher in effectively assessing the progress of the student and in prescribing challenging new experiences, it is unlikely that any set of prestated instructional objectives will ever circumscribe the learning that even one student will absorb from an organized series of experiences. As a teacher gains experience in preparing and implementing instructional objectives and using them as a criteria for assessing individual student learning, the teacher will show increased capability to describe more completely the learning outcomes in behavioral terms; however, this ability can never be entirely perfected. Also, the action described by any behavioral objective only identifies an overt student behavior which may indicate that the desired learning has occurred; it is only after the student displays many varied actions over a period of time that there can be real assurance that a complete learning experience had taken place. For the reasons above, any set of behavioral objectives will only partially describe the desired learning outcomes.

As a school district accepts its responsibility to infuse an environmental program into its curriculum, it may need suggestions about the kinds of activities which will aid students in eventually internalizing an environmental ethic. To assist in this endeavor, a series of instructional objectives follows for use as an initial pool from which schools can draw as they begin developing programs.

In writing these objectives, we have tried to avoid describing specific activities and to keep each one broad enough that a variety of activities can facilitate its achievement. It is hoped, that, as teachers and local curriculum committees examine these objectives for ideas in the development of their programs, many locally applicable activities will emerge and that other objectives and activities will be developed which extend the program and its implementation proceeds.

The objectives in the design have been written and classified under the six major global objectives. For each objective, the grade level and subject areas into which it may be logically infused has been suggested. Writing activities for each instructional objective was considered, but it was felt that classroom teachers are better qualified to develop specific activities to meet local needs and conditions; however, four model units containing possible learning activities were included in the last section.

This publication is presented to schools not as a curriculum but as an aid for enriching their programs. This design is not meant to be all-encompassing. It is the beginning of a K-12 interdisciplinary environmental education program.

The coding in this guide for curriculum areas is:

(H) - Health; (H Ec) - Home Economics; (LA) - Language Arts;
(M) - Mathematics; (Psy) - Psychology; (SC) - Science;
(SS) - Social Studies; (VA) - Vocational Agriculture;
(IA) - Industrial Arts; (CA) - Creative Arts; and
(B) - Business.

The fact that many disciplines are not listed in this coding does not mean environmental concepts cannot be infused into them. Reading, music, physical education, driver education, drug education and other disciplines can easily introduce relevant environmental experiences into their daily activities.



ENERGY

GLOBAL OBJECTIVE A:

The student will support and practice wise utilization of traditional sources of energy and also support expenditures for research and development of alternate energy sources.

		INSTRUCTIONAL OBJECTIVES: Provided with the necessary activities, experiences, data and information, the student will:	SUGGESTED CURRICULUM AREAS
SUGGESTED GRADE LEVEL			
K-3	1.	identify and/or name sources of energy which are used in daily life.	Sc, SS
K-3	2.	trace items of clothing and food back to their energy source.	Sc
K-3	3.	report to the class examples of energy in the community.	Sc, LA
K-3	4.	identify two examples in his school showing how energy is used.	Sc
4-6	5.	use the oral or written word or the dramatic arts to portray his dependence on the sun.	Sc, LA, CA
4-6	6.	identify positive and negative effects resulting from the production of electricity from chemical, thermonuclear and solar energy sources.	Sc, SS, H
4-6	7.	give examples of how the availability of energy and economic growth are inter-related.	Sc, SS
4-6	8.	relate the increased demand for energy to pollution and resource depletion.	Sc, H, SS
4-6	9.	propose options to the internal combustion engine as a main source of power for public transportation.	Sc, SS, M

4-6	10.	compare life styles of societies having access to different energy sources.	Sc, SS
4-6	11.	list changes people can make in their own living habits which would place less demand on available energy sources.	Sc, SS
4-6	12.	relate changing world population to future energy supplies.	Sc, SS, H
7-9	13.	collect data on petroleum reserves and suggest practices which would slow the depletion of these reserves.	Sc, SS, M
7-9	14.	list and describe ways your community can better manage electrical energy consumption.	Sc, SS
7-9	15.	collect data on solid fossil fuel reserves and discuss the environmental impact of utilizing these reserves in various energy consumption modes.	Sc, SS, H, H Ec, VA
7-9	16.	discuss the feasibility of converting the electrical energy industry to a nuclear power base and compare the merits of such a proposal with other optional basic energy sources.	Sc, SS, H, LA
7-9	17.	debate the proposition: "As population and harnessed energy expand, the environment will continue to sustain life in a quality manner."	Sc, SS, H, LA
7-9	18.	develop programs which will promote concern for avoiding exploitation of our energy resources.	SS, H, LA
7-9	19.	list convenience products (including packaging items) which are used daily, describe their impact on our energy reserves and identify related habits that be can developed to conserve energy.	Sc, SS, H, H Ec, CA
7-9	20.	plan and carry out activities to improve the energy management of the school.	Sc, SS

7-9	21.	select a convenience product being advertised in the media and project the energy consumption which would result from mass utilization of it.	Sc, SS, M
7-9	22.	discuss how changing to battery or electric powered cars could simply be a shift from one pollution problem to another.	Sc, SS, H, LA
7-9	23.	Compare the energy (calories) used in cultivating an acre of land with that produced by the crops and discuss such "tradeoffs" in terms of impact on fossil fuel reserves.	Sc, SS, H
7-9	24.	identify energy problems that will be serious by the year 2000 if current practices are not changed and suggest necessary changes.	Sc, SS
7-9	25.	discuss how economic development practices can either enhance or disrupt the energy flow through food chains.	Sc, SS, H, VA
7-9	26.	use various media to demonstrate human energy dependence on the sun.	Sc, LA
7-9	27.	write an essay which compares and contrasts modern and ancient concepts of the sun.	Sc, LA
7-9	28.	use various media to demonstrate how human desire for economic gains affected energy resources.	Sc, LA, SS, M
7-9	29.	use various media to present evidence for the need to improve the management of our energy resources.	Sc, LA, SS, M
10-12	30. A.	collect data on the current rate of energy consumption and predict either the zero supply date or the steady-state date for two or more sources of energy.	Sc, SS, M
10-12	B.	project the environmental impact of the utilization of various energy sources. This impact study should consider not only the effects of the waste products of the utilization	Sc, SS, H

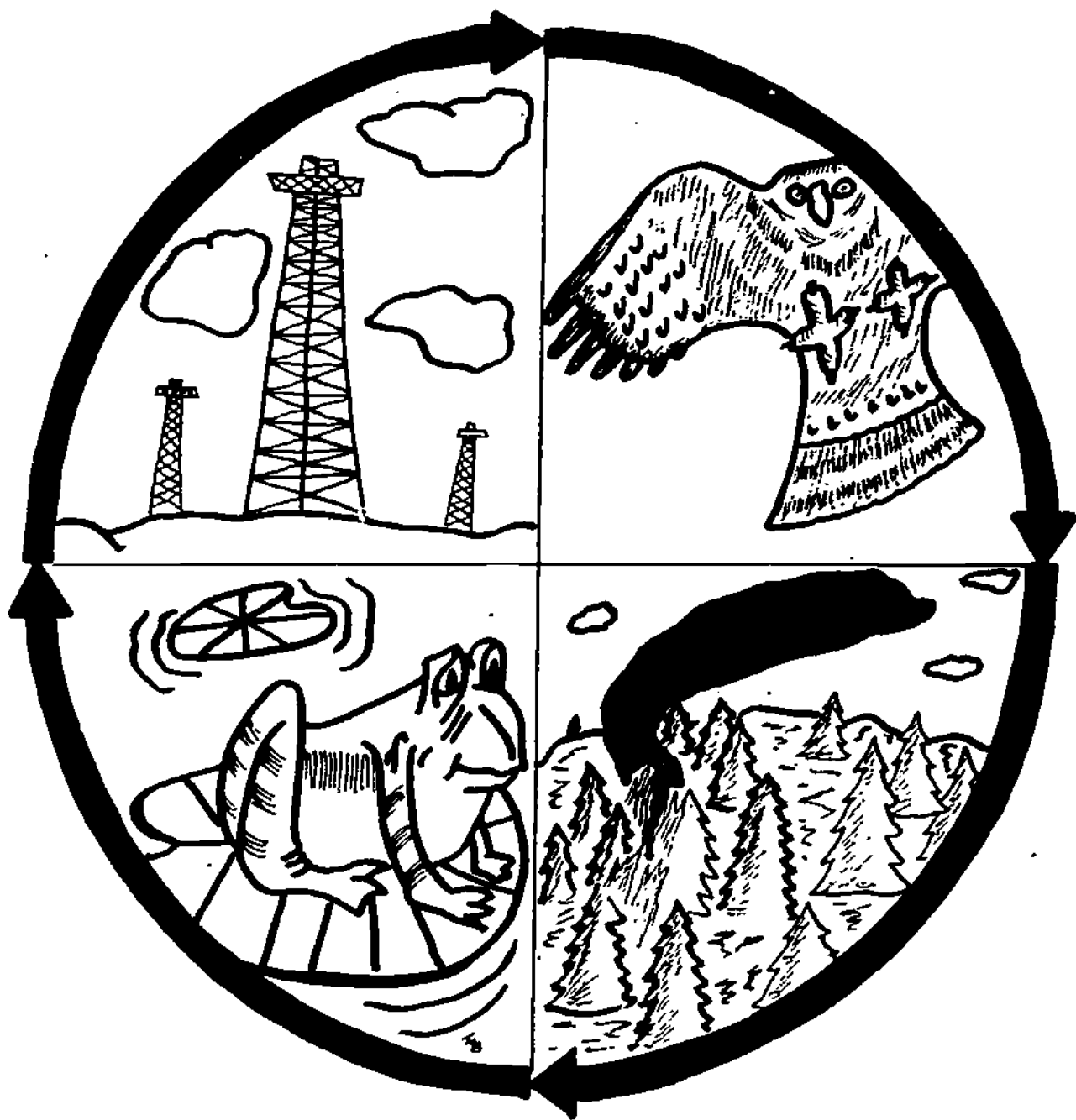
process itself but the environmental degradation that results from securing, transporting and processing the energy sources for utilization, i.e., final consumption, and the energy requirements for these processes.

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| 10-12 | C. | analyze human needs in terms of energy requirements (both direct and indirect;) and combine this information with that derived from the two previous objectives to suggest the best energy source to be utilized in providing for each need. | Sc, SS |
| 10-12 | D. | analyze the American life style in comparison with various other life styles to propose a life style to propose a life style which would provide a balance in terms of energy pool and quality of life. | Sc, SS, H |
| 10-12 | E. | discuss the feasibility of discovering and developing new energy sources as others are depleted, e.g., undiscovered fossil fuel beds or improved technology for harnessing current resources. | Sc, SS |
| 10-12 | F. | <p>propose mechanisms based on the second law of thermodynamics for harnessing the enthalpy to entropy energy flow of the earth system, the solar system and/or the universe. Also:</p> <ol style="list-style-type: none"> 1. evaluate the feasibility of implementing this proposal. 2. prepare a program to present the need for this proposal to the class, the community or other groups or 3. construct a working model of this proposal. | Sc, SS, H, LA, CA |
| 10-12 | 31. | project how implementing an apparent solution to a pollution problem may increase the demand on the earth's energy resources. | Sc, SS, H |
| 10-12 | 32. | contract the food web for two or more dietary systems of different human societies and the corresponding food pyramids to compare the effects of various diets on the world's energy pool. | Sc, H Ec, H, VA |

10-12

33. project the total environment cost of different modes of transportation that could be used for moving goods and/or people and select the one or the combination of modes which will provide an optimum balance in terms of energy conservation, environmental poisoning and human convenience.

Sc. SS. H. M



EARTH RESOURCES

GLOBAL OBJECTIVE B:

When faced with decisions concerning the use of earth resources, the student will select practices developed in recognition of present and future environmental needs.

Suggested Grade Level	Instructional Objectives: Provided with the necessary activities, experiences, data and information, the student will:	Suggested Curriculum Areas
K-3	1. describe and diagram his own community, showing where water and food is obtained and wastes (solid and liquid) are disposed.	SS, H
K-3	2. list the observations made with the five senses while walking through the neighborhood, a woods, etc.	SS, LA
K-3	3. distinguish between the needs and luxuries of a family by classifying pictures into these groups.	SS, LA
K-3	4. indicate when various foods are shipped into his area by placing a W (Winter) and/or S (Summer) by pictures of the foods or their names in a listing.	SS, LA
K-3	5. construct a scrapbook or other device which illustrates the needs of humans - clothing, food, fuel, shelter and their plant, animal or mineral source.	SS, LA
K-3	6. name examples of how needs and luxuries both use up natural resources and cause pollution.	Sc, SS
K-3	7. classify environmental changes from before-after picture sets as natural or human-caused.	SS, Sc
K-3	8. label rings on a stump or log cross-section which came into being at the same time as various events in that person's or his family's life.	SS, M

K-3	9.	identify uses people make of trees or other plants (food, shade, lumber, paper, bows, arrows, furniture, etc.).	SS, Sc
K-3	10.	record by pictures or stories the appearance of a tree or bush at the various seasons of the year and write a poem or story describing the change.	LA, A
K-3	11.	present a program dramatizing why forest fires should be prevented and how to prevent them.	LA, SS
K-3	12.	record wildlife that has been seen during a given time period noting the animal, date, time and location.	SS, Sc
K-3	13.	locate safe and unsafe drinking water supplies in the community.	Sc, SS
K-3	14.	name ways the surroundings can be improved.	LA, H, SS
K-3	15.	record for one day pleasant and unpleasant sights that are observed.	LA, H
K-3	16.	name three pleasant and unpleasant odors and identify their source.	LA, Sc, H
K-3	17.	identify places where there is a lack of air (plastic bags, trunks, sand banks, etc.).	LA, H
K-3	18.	list words that tell about the conditions of the air and write a poem or story using these words.	LA, H
K-3	19.	list ways water issued in daily living.	LA, SS
K-3	20.	construct a rain gauge and record amount of rainfall.	Sc, M
K-3	21.	describe or illustrate the path of a stream that has been observed and discuss changes in its character along its path.	Sc, H, LA
K-3	22.	use the oral or written word or the dramatic art to portray dependence on clean water.	LA, H, Sc

K-3	23.	describe or illustrate how land is used in this community.	Sc, SS
K-3	24.	identify areas where erosion is in evidence.	Sc, SS
K-3	25.	examine a cubic foot of earth, list, and report findings to the class.	Sc, LA, M
K-3	26.	plant similar seeds in different kinds of soil and record the difference in their growth when given similar amounts of water and sunshine.	Sc, M
K-3	27.	plant and cultivate a flower or vegetable garden at home or school and identify ways the environment was controlled to produce desired ends.	Sc, SS
4-6	28.	rank modes of transportation according to impact on resources using modes such as wagon, airplane, foot, car and train.	LA, SS, H
4-6	29.	locate resources in the neighborhood, community and county which are under-going change.	Sc, SS, H
4-6	30.	name resources which are used and classify those which are renewable and those upon which people are dependent for basic needs.	Sc, SS
4-6	31.	name and classify individuals upon whom we are dependent for basic needs.	Sc, SS
4-6	32.	identify problems involving soil, water, air and plant life in the community and suggest and defend possible solutions to the problems.	Sc, SS, H
4-6	33.	illustrate that resources such as iron, coal and minerals must be conserved.	Sc, SS
4-6	34.	give examples which demonstrate how depletion of one resource can increase demands for another.	Sc, SS
4-6	35.	explain how the uneven distribution of natural	SS

resources affects the citizens of various countries including the United States.

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| 4-6 | 36. | discuss the concept that the earth is a spaceship with limited resources and has a limited capacity for recycling. | Sc, SS, H |
| 4-6 | 37. | suggest political, social, economic and industrial reasons for proposing laws about use of natural resources. | Sc, SS, H |
| 4-6 | 38. | develop a model to demonstrate how water can be recycled. | Sc, SS, H |
| 4-6 | 39. | write an imaginative story about a drop of water's journey through the water cycle. | Sc, LA, H |
| 4-6 | 40. | compute the volume of water falling on a specified area during a one-inch rainfall. | Sc, M |
| 4-6 | 41. | estimate the cost of water one uses per year if water costs 10c per gallon. | M |
| 4-6 | 42. | explain how large bodies of water affect the climate in his locality and discuss how climate affects human behavior. | Sc, SS, LA |
| 4-6 | 43. | design a dramatic production to illustrate the dependence of plants and animals upon water as a resource. | Sc, LA, CA |
| 4-6 | 44. | cite examples illustrating how water management and conservation practices have affected the usefulness of land. | SS |
| 4-6 | 45. | identify and map a local watershed. | Sc, SS |
| 4-6 | 46. | identify community practices that will improve water quality downstream. | Sc, SS, H |
| 4-6 | 47. | illustrate, using specific data, how delay increases the cost of cleaning up water. | SS, H, M |
| 4-6 | 48. | defend or oppose the statement: "Environmental legislation and enforcement are necessary to preserve the quality of the oceans." | Sc, SS, H, LA |

4-6	49.	collect data on the percentage of the world's oxygen supply provided by the oceans and identify the key organisms in this cycle.	Sc, H
4-6	50.	collect data, photographic records, etc., which provide evidence of the sources of air pollution.	Sc, H
4-6	51.	give examples of naturally occurring air pollution.	Sc, H
4-6	52.	collect evidence of air pollution causing deterioration of cement, etc.	Sc, H
4-6	53.	explain how air is a reusable resource by indicating ways it is cleansed by nature, and to a limited degree by man.	Sc, H
4-6	54.	propose an experiment which demonstrates air is an essential natural resource.	Sc, H
4-6	55.	evaluate people's attempts to control air pollution by legislation.	SS, H
4-6	56.	volunteer to research how people, plants and machines use air and report this to class.	LA, H
4-6	57.	explain how heat and light reaching the earth are affected by air quality and influence life.	LA, H, Sc
4-6	58.	describe the personal and financial commitments a person must make in order to have clean air to breathe.	SS, H
4-6	59.	design an audiovisual presentation which depicts air quality as "everyone's" responsibility.	Sc, SS, LA, H
4-6	60.	explain why trees are renewable resources.	Sc, SS
4-6	61.	identify and explain important functions of a plant or tree.	Sc
4-6	62.	use local examples to describe or demonstrate how plants and trees control soil erosion.	Sc, SS

4-6	63.	collect and report data demonstrating the results of overgrazing, insects, forest fires and improper management on forests.	Sc, SS, LA,
4-6	64.	develop a report which compares short-term gains and long-range effects of various forest management programs.	Sc, SS, LA
4-6	65.	suggest options open to society which will assure future supply of forest products (i.e., recycling paper, optional building materials, optional resources for cellulose, tree farming, etc.)	Sc, SS
4-6	66.	describe in a report the role of the U.S. Forest Service, state government, industry or individuals in managing forests.	SS, Sc, LA
4-6	67.	suggest ways of increasing the recreational values of a forest.	SS, H, Sc
4-6	68.	discuss how wildlife is a usable resource.	SS
4-6	69.	debate the resolution: "People can survive without most forms of wildlife."	SS, LA, H
4-6	70.	relate human activities to various species becoming endangered or extinct.	SS, Sc, H, LA
4-6	71.	list and discuss legislation affecting wildlife management.	Sc, SS
4-6	72.	select two communities and compare natural resource usage.	LA, SS, H
4-6	73.	trace three products back to their origin to illustrate the total human dependence on soil.	SS, Sc
4-6	74.	write a story or drama to depict the changes that would occur in a community following the damming of a stream flowing through it.	SS, Sc, H, LA, CA
4-6	75.	give examples of how irrigation has brought unproductive land into useful production.	Sc, SS
4-6	76.	map location of essential mineral reserves throughout the world.	SS, LA

4-6	77.	construct a chart or graph showing how advances in technology will increase mineral use.	SS, Sc, M
4-6	78.	construct charts and graphs which compare the use of minerals and fuels from 1900 until the present.	Sc, SS
7-9	79.	compute the land area of the world in square kilometres and hectares.	SS, LA
7-9	80.	calculate the area of the earth which is compatible to human survival.	SS, M, Sc
7-9	81.	calculate the amount of corn that could be grown on hectares covered by highways.	SS, VA, M
7-9	82.	explain the economic and ecological advantages of using an organic garden.	Sc, VA
7-9	83.	discuss the implications of the data provided by charts and graphs which compare the use of minerals and fuels from 1900 until the present.	SS
7-9	84.	debate the resolution: "The coal industry has an obligation to reclaim the earth's surface it disturbs."	SS, Sc, LA
7-9	85.	collect information about the changes of wildlife distribution in this community during the past 10 to 20 years and develop a public presentation on the topic.	LA, VA, Sc
7-9	86.	write a theme or prepare a speech about wildlife habitat management.	VA, LA, Sc
7-9	87.	plan and implement projects to attract acceptable forms of wildlife to the school grounds.	VA, Sc, LA
7-9	88.	design and utilize methods for observing and recording wildlife habits without disturbing its activities.	VA, Sc
7-9	89.	prepare a community wildlife improvement plan which has a potential of being implemented.	VA, Sc, SS

7-9	90.	discuss the need for preserving natural areas and related legislative needs.	Sc, SS
7-9	91.	debate the resolution: "Resolved people do not need the great blue heron, timber wolf, killer whale, or other wildlife."	LA, SS, Sc, H
7-9	92.	debate the advisability of pet ownership by city dwellers.	SS, Sc, H, LA
7-9	93.	prepare a world wildlife summary and present findings to the class or other groups.	Sc, SS, LA, M
7-9	94.	use data concerning road, industrial and housing construction to estimate how long adequate wildlife habitat, watersheds, recreation areas or good farmland will remain.	SS, Sc, M
7-9	95.	discuss the use of hunting seasons to manage wildlife.	SS, Sc
7-9	96.	gather data and prepare a presentation on endangered species.	SS, Sc, LA
7-9	97.	take a stand on "clear-cutting" forests and provide evidence to convince classmates and/or citizens of this position.	SS, Sc
7-9	98.	construct maps which identify areas of the earth having an annual rainfall of less than 20 centimetres and having an annual temperature of less than 15 degrees celsius.	SS, Sc
7-9	99.	illustrate the hydrologic cycle and how man has affected it.	Sc, SS
7-9	100.	demonstrate and project in a formal speech ways life patterns are formed by the distribution of water supply.	LA, SS, H
7-9	101.	identify ways, both public and private, for reducing consumption of potable water.	SS, H, Sc
7-9	102.	identify ways to improve water management in his school.	SS, H

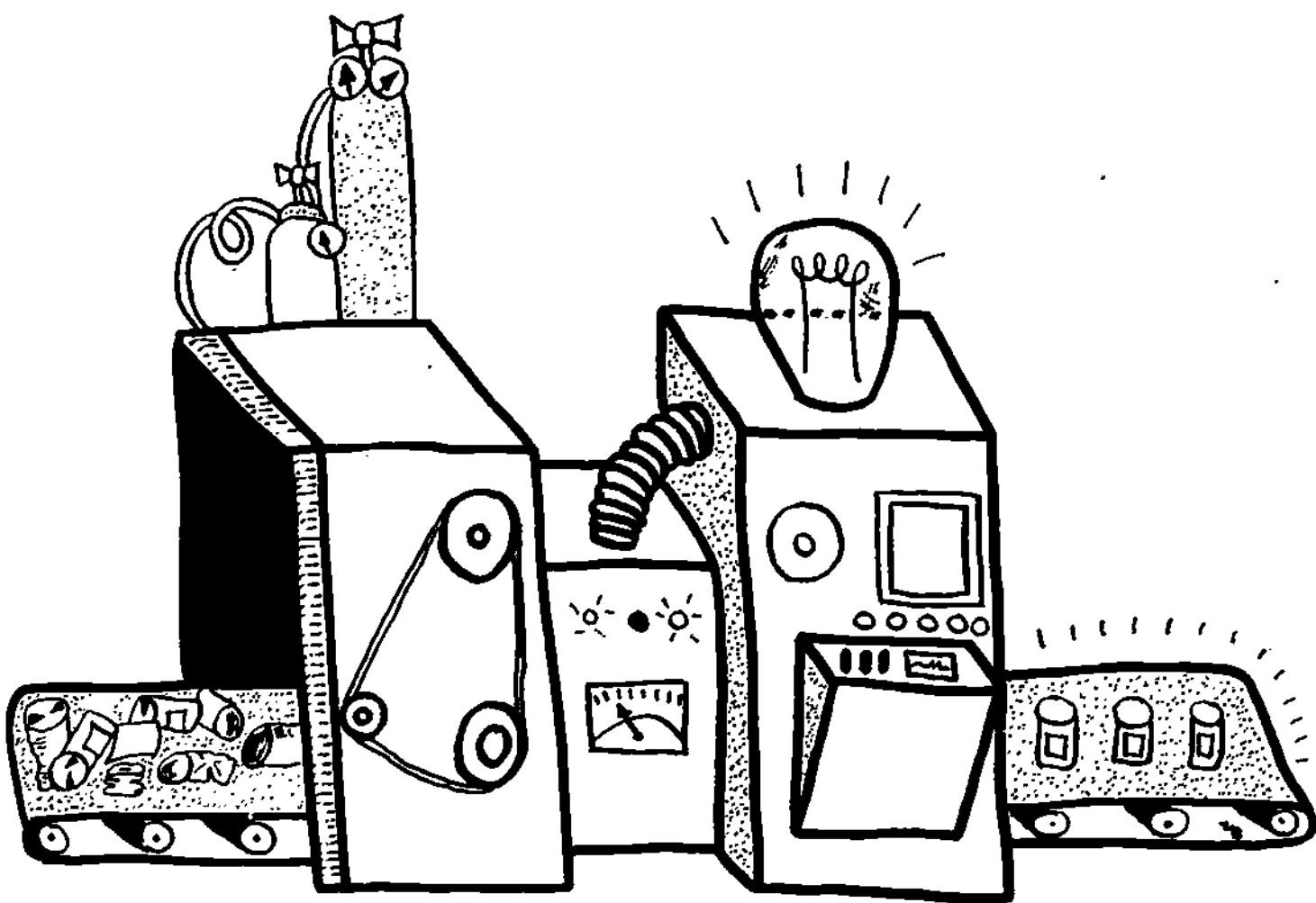
7-9	103.	list soil and water use practices which affect the rate of river bank erosion.	VA, SS, Sc
7-9	104.	calculate the amount of water required to produce various products, both manufactured and natural, including food.	VA, M, Sc
7-9	105.	evaluate the effects of forms of water quality on human environment in different periods of history after reading such writings as Longfellow's <i>Evangeline</i> , Parts II and III, and Heyerdahl's <i>Ra Expedition</i> , etc.	LA, Sc, SS
7-9	106.	debate the proposition: "Local water quality is adequate for the local needs."	LA, Sc, H
7-9	107.	relate, in an imaginative story, what would happen if a supply of clean water were no longer available.	LA, SS, H, Sc
7-9	108.	select a newspaper article, poem, story or original writing which emphasizes human or animal needs for pure water.	LA
7-9	109.	explain why the bottled water business is becoming a profitable enterprise in California.	B, SS, H
7-9	110.	explain how water pollution by industrial chemicals in other states and nations affects life in Delaware.	SS, H, Sc
7-9	111.	collect data which shows the effects of pesticides, insecticides, poisonous chemicals, oil, untreated sewage, fertilizers, etc. on life.	SS, Sc, H, M
7-9	112.	identify possible untapped water sources and discuss the feasibility of using each.	SS, H, Sc
7-9	113.	use various media to report on air quality in this community.	LA, Sc, M
7-9	114.	distinguish fact from opinion about air quality expressed in newspaper articles and other media.	LA, Sc
7-9	115.	use various media to present a plan for improving the air quality of this community.	LA, H, Sc, SS

7-9	116.	report on air quality in the 19th and 20th centuries. (Read Dickens' A Christmas Carol, "Marleys Ghost", etc.)	LA, Sc, CA
7-9	117.	collect and analyze data on the history of air quality near population centers and relate findings to major changes in life styles such as the industrial revolution.	SS, Sc, M, H
7-9	118.	evaluate Delaware's efforts to improve air quality.	SS, H
7-9	119.	design materials showing the amount of gasoline, paper, meat, milk, bottles, cans, automobiles, water or clothing used by Americans in a year.	LA, B, M, CA
7-9	120.	compare the environmental impact of a native American or pioneer to the impact of a modern American.	H, B, VA, SS
7-9	121.	analyze common life styles in terms of basic needs and human convenience.	LA, SS, B
7-9	122.	analyze the present styles of living in terms of the Earth's limited resources.	SS, H, B
7-9	123.	evaluate current advertising practices in terms of their potential environmental impact.	LA, H, B, Sc, SS
7-9	124.	project the earth's resource depletion rate if all people consumed natural resources at the rate Americans do.	SS, H, B, Sc
7-9	125.	develop a presentation describing the action Americans must take to insure adequate resources for future generations.	SS, Sc, LA, CA
7-9	126.	identify four individuals who have worked diligently to improve the environment and express appreciation of their efforts by writing or visiting them.	SS, LA
7-9	127.	identify several organizations responsible for improving the environment and explain the role each is playing in solving environmental problems.	VA, SS

7-9	128.	design materials to show how smog develops in a major metropolitan area.	SS, Sc, CA, H
10-12	129. A.	collect and evaluate supply and demand data on local-, state-, national- or world- projected demand of two or more non-renewable resources and predict the zero supply date for each.	Sc, M, B
10-12	B.	propose methods for delaying the zero supply date of a non-renewable resource and analyze the effects of these proposals on the environment and life styles.	Sc, SS, B
10-12	C.	select a plan to delay zero supply dates and design a program to communicate the need for action.	Sc, LA, SS, CA
10-12	D.	analyze the environmental impact of utilizing one or more natural or man-made substitutes for a non-renewable resource, considering supply, energy needed to secure and process it, and its potential as a pollutant.	Sc, M, B
10-12	130. A.	secure and evaluate data on the local, state, national and/or world supply of renewable resources, their current depletion rate (in terms of both quantity and quality) and the demands of society on the products of these resources and determine the various mechanisms that affect the depletion of one or more of these resources.	Sc, SS, B
10-12	B.	propose methods for arresting and, if possible, reversing the depletion rate of a renewable resource to provide an optimal steady state supply of the resource and analyze the effects of his proposals on the environment and life styles.	Sc, SS, M, B
10-12	C.	design a program for communicating the need for action to arrest and/or reverse the depletion rate of a renewable earth resource.	Sc, LA, SS, CA
10-12	131.	define the role which science and technology can and should play in developing and implementing solutions to an earth resource problem.	Sc, B, SS

10-12	132.	name five ways Delaware rivers are being misused and propose a plan which would alleviate each problem.	SS, H, Sc
10-12	133.	locate areas on a Delaware map having primary, secondary and tertiary sewage treatment plants.	SS, H, Sc
10-12	134.	defend or oppose a plan to construct another man-made canal through Delaware to connect the Delaware Bay and the Chesapeake Bay.	B, SS, H
10-12	135.	predict the future of game fish in the Delaware Bay.	Sc, H, B
10-12	136.	construct a world map showing major water pollution centers (rivers, lakes, oceans) and sources and discuss their probable permanence.	SS, H, Sc
10-12	137.	determine and compare percapita consumption of various societies.	SS, H, M, B
10-12	138.	conduct research to determine far-reaching effects of pollutants dumped into nearby streams and lakes and report this information to class and community.	SS, H, Sc
10-12	139.	present views concerning the economic and ecological implications of using algae from the ocean as food supplement.	H Ec, Sc
10-12	140.	research and report the economic and ecological feasibility of using desalted ocean water for purposes of irrigation and human consumption.	Sc, B, SS, H
10-12	141.	determine the percentage of naturally recycled oxygen resulting from the ocean, identify the organisms involved, describe the effect of pollution on these organisms and propose a model regulatory system for coping with these problems.	Sc, SS, H
10-12	142.	plan and conduct a mass media presentation dealing with water and/or air quality.	LA, Sc, SS, H, CA, B

10-12	143.	design and/or participate in a school site management plan.	VA, Sc, CA
10-12	144.	develop a farm land use and management that will maximize this land's potential service to present and future generations.	VA, SS, Sc
10-12	145.	identify and explain problems resulting from intensified food production.	VA, H, Sc
10-12	146.	review how Steinbeck's <i>Grapes of Wrath</i> identifies the effect of human manipulation of the land.	LA, SS, Sc
10-12	147.	discuss the effects of water wildlife management using as examples the brown pelican, swordfish, killer whale, etc.	SS, Sc
10-12	148.	prepare a report on annual activities dealing with wildlife management in which individuals and the school could participate.	LA, Sc
10-12	149.	investigate and report on possible environmental careers.	Sc, H, SS
10-12	150.	become actively involved in a civic environmental problem that is immediate and relevant and make periodic reports on progress to the class.	LA, SS
10-12	151.	analyze the impact the news media has on public views of environmental issues.	LA, SS, B
10-12	152.	debate the resolution: "The United States cannot afford to build smaller cars, produce less clothing, construct fewer highways, etc."	B, SS, LA, H



RESOURCE RECLAMATION

GLOBAL OBJECTIVE C:

The student will voluntarily participate in programs involving resource reclamation.

Suggested Grade Level	Instructional Objectives: Provided with the necessary activities, experiences, data and information, the student will:	Suggested Curriculum Areas
K-3	1. identify and give examples of items which should be used more than once.	SS, Sc
K-3	2. identify areas in the community where wastes are treated, handled or dumped.	SS, Sc
K-3	3. compare space taken by two emptied cans when one is flattened and one is not.	Sc, LA
K-3	4. propose a better use for cans than throwing them in the garbage.	Sc, SS
K-3	5. tell how families recycle wastes.	Sc, H, SS
K-3	6. collect all the litter found on the school grounds in a day and estimate the amount of litter produced per student in the school.	M, Sc
K-3	7. organize a program to encourage others to help prevent the school grounds from becoming littered.	Sc, CA, LA
K-3	8. plan and participate in collection campaigns which will help in the recycling of waste materials.	Sc, SS
K-3	9. classify litter collected around the school (or in the neighborhood;) into various groups: natural or human made, designed as a container or non-container, plastic or non-plastic, etc.	Sc

4-6	10.	identify items used which may be recycled.	Sc, SS
4-6	11.	identify some specific, nearby locations in this community where recyclable materials may be taken for processing.	Sc, SS, H
4-6	12.	suggest possible methods of recycling for this community which would be both practical and suitable for maintaining a high quality of life.	Sc, SS, H
4-6	13.	prepare a presentation about the amount of materials produced in the school or community.	LA, CA
4-6	14.	defend the recycling of paper, metals, plastics, etc., using data regarding the depletion of that particular resource of raw materials.	SS, Sc
4-6	15.	ask five families if they would be willing to recycle their solid wastes and report findings of survey to class.	LA, SS
4-6	16.	identify materials used daily and trace them to minerals used in making the product.	SS, Sc
4-6	17.	use various media to depict how waste disposal is related to environmental quality.	Sc, SS, H, LA, CA
4-6	18.	predict the effects of paper recycling programs on forests.	SS, Sc
4-6	19.	plan a presentation encouraging solutions to pollution problems.	LA, H, SS
7-9	20.	give three examples of how humans waste minerals in daily living habits and propose a better use plan for each.	SS, Sc, B
7-9	21.	predict the effects of not recycling minerals in terms of future costs and availability.	SS, M, B
7-9	22.	calculate the tons of recyclable materials produced in the United States in a year.	SS, M, B
7-9	23.	use current data on use of minerals to project	SS, M, B

future reserves and examine how mass recycling would change this projection.

7-9	24.	debate the resolution: "Each American family should be restricted to one car."	SS, B, Sc, LA
7-9	25.	debate the resolution: "Non-returnable bottles and aluminum cans should not be allowed in school buildings."	SS, Sc, LA, B
7-9	26.	identify materials which can be recycled and propose a plan to accomplish maximum recycling in the community.	SS, Sc
7-9	27.	plan and publicize a recycling project.	LA, CA, SS, Sc
7-9	28.	list practices in the home which waste resources and propose better practices.	SS, Sc, H Ed, H, B
7-9	29.	evaluate existing recycling programs in his community.	SS, Sc, H
7-9	30.	analyze the effect of various waste disposal systems on the environment and state the conditions which would make each system advisable.	Sc, H, SS
7-9	31.	debate the resolution: "Business and industry are currently fulfilling their responsibility in the management of non-renewable resources."	SS, LA, Sc, H, B
7-9	32.	discuss the adequacy of existing solid waste laws.	SS, Sc
7-9	33.	develop a state non-renewable resource management model.	SS, Sc, B
7-9	34.	discuss the adequacy of federal and state budgeting for the deveopment of solid waste recycling.	SS, Sc
7-9	35.	discuss the relation between a nation's waste burden and its level of civilization.	SS, LA
10-12	36. A.	compile enough information to classify human, industrial and business wastes into one or	Sc, SS, B

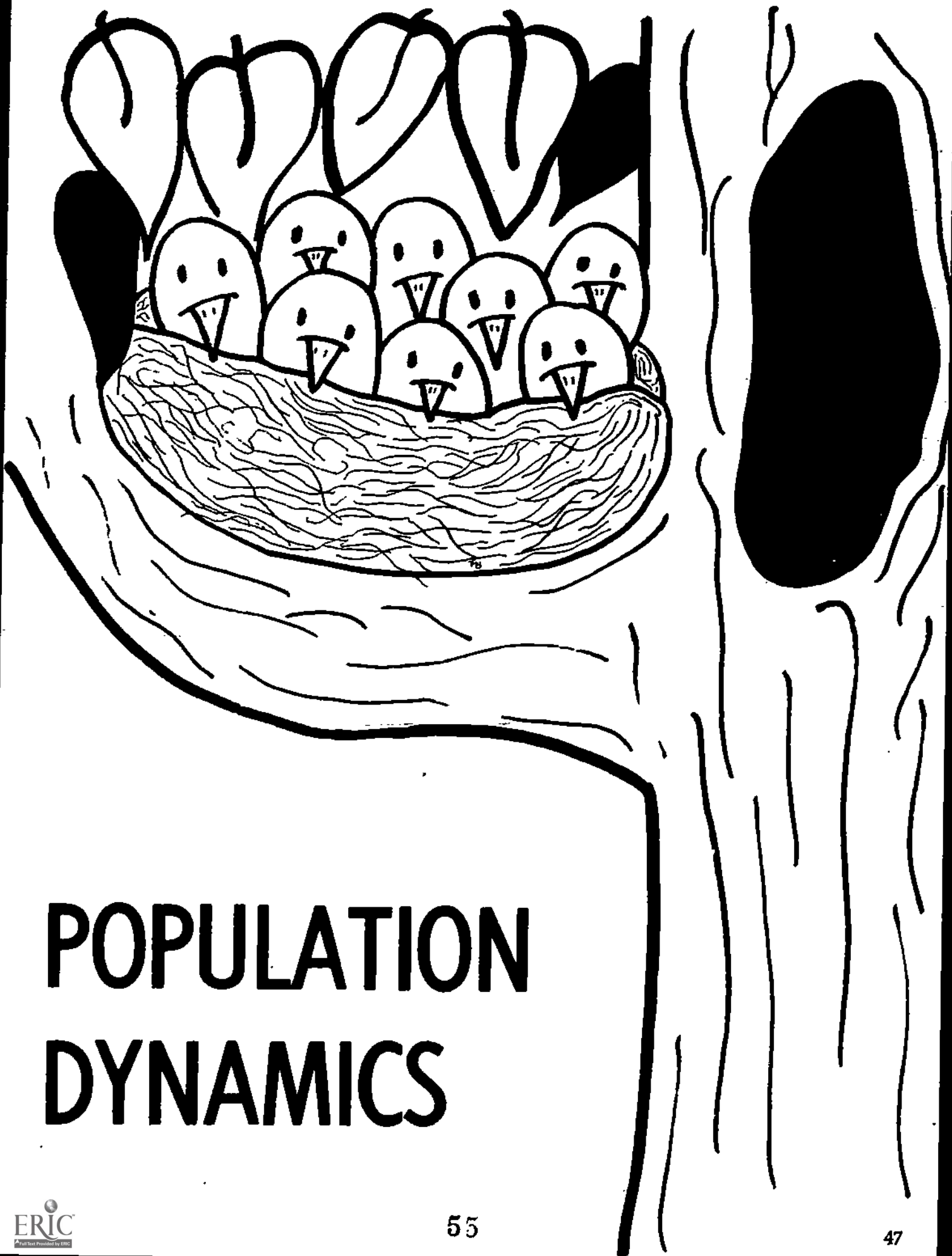
more of the following categories: returnable and reusable in form, a reclaimable by-product, recyclable by technology (i.e., would require small energy input), recyclable with great energy consumption or practically non-recyclable.

- | | | | |
|-------|-----|---|----------------------|
| 10-12 | B. | classify non-recyclable and expensively recyclable wastes as essential by-products of human life or by products of human convenience. | Sc, SS, B |
| 10-12 | C. | assess the environmental impact of the accumulation of wastes not easily recyclable, but essential by-products of human life, on the continuing evolutionary processes of the earth and propose optimal methods for the management of these wastes. | SS, Sc, H |
| 10-12 | D. | use data to propose viable programs for minimizing the accumulation of human-generated wastes in the air, water and soil and analyze the effects of such programs on life styles. | Sc, SS, B |
| 10-12 | E. | design a program to effectively communicate the need and feasibility of recommended action for an acceptable waste management program. | LA, SS, Sc, H, CA, B |
| 10-12 | 37. | collect the needed information on two or more current or proposed methods of waste disposal and compare their potential environmental impact in terms of harboring pests and disease and/or poisoning various life forms (e.g. landfills vs. open dump, septic tank vs. secondary treatment). | Sc, SS, H |
| 10-12 | 38. | illustrate how changing "life styles" may prevent a world catastrophe. | SS, B, Sc, LA |
| 10-12 | 39. | evaluate the following waste management proposals: | SS, H, H Ed, LA, Sc |
| | A. | "ship solid waste to abandoned mines to be stockpiled for future use." | |

- B. "compress trash into building bricks."
- C. "mulch solid waste for use as fertilizer."
- D. "simplify and/or reduce packaging of solid products."
- E. "use reusable packaging for all liquid products."

10-12	40.	document the extent of open dumping in the community and discuss its impact on community pride.	SS, LA, Sc, CA
10-12	41.	collect data on ocean dumping and its potential hazard to the human species.	SS, Sc, H
10-12	42.	review current federal, state or local legislation dealing with solid waste disposal and examine its strengths and inadequacies.	H, SS, Sc
10-12	43.	plan a community recycling project of as many items as the class determines to be practical.	SS, H, LA, Sc
10-12	44.	plan an organic gardening project for home, school or community which demonstrates the value of recycling organic wastes.	SS, VA, H Ec
10-12	45.	construct a model of a typical septic system, describe the function of each part and/or discuss its adequacy as a treatment system.	H, Sc
10-12	46.	investigate the possibility of installing a "Lagoon System" in the community and report findings to the school and community.	H, Sc, SS, LA
10-12	47.	calculate the cost per family of various types of sewage treatment systems and compare their effectiveness.	H, M, Sc, B
10-12	48.	demonstrate the effect of thermal pollution on algae growth and its effect on other life in the water.	H, Sc, B
10-12	49.	determine techniques for locating sources of water pollution.	H, Sc, B

10-12	50.	identify polluters of water in his area and describe steps that a private citizen can take in an attempt to correct each problem.	H. SS. Sc. B
10-12	51.	identify diseases which may result from the drinking of polluted water.	H. Sc
10-12	52.	develop a workable plan for recycling water which would be appropriate for his particular community.	H. Sc. SS



POPULATION DYNAMICS

GLOBAL OBJECTIVE D:

The student will demonstrate his awareness of population processes and dynamics by rationally defending a position on population management.*

Suggested Grade Level	Instructional Objectives: Provided with the necessary activities, ex- periences, data and information, the student will:	Suggested Curriculum Areas
K-3	1. explain feelings about overcrowded conditions after two classes have shared a classroom for a period of time.	SS, Sc
K-3	2. list places to play and compare them to places he would like to play.	SS
K-3	3. make observations of a closed terrarium or aquarium and record by pictures the changes in population which occur throughout the year.	Sc, CA
K-3	4. observe and record changes in the outdoor populations which occur as the seasons change.	Sc, M
K-3	5. compare the number of people who live in a single building in the city with people per building in the country (after a trip to the country or city).	SS, M
K-3	6. compare the play of city children with the play of country children (after a trip to the city or country).	SS
K-3	7. compare the size of one family with the families of others in the classroom.	SS, M

*See definition of Population Education on
Page 56

4-6	8.	compare available space per person today with the space that was available in the year 1900.	SS, Sc, M
4-6	9.	compare the ease with which various human wants and needs can be met in urban and rural environments.	SS, H, Sc, LA
4-6	10.	identify some effects that food, disease, birth rate and land use have upon life expectancy.	SS, H, Sc
4-6	11.	compare the roads of long ago with modern day roads, showing change in use due to population growth.	SS, LA
4-6	12.	construct a food web for an eco-community that have been observed.	Sc, SS
4-6	13.	establish a balanced aquarium either at school or at home.	Sc, SS
4-6	A.	identify population variables which, if manipulated, would have an effect on the aquarium environment.	Sc
4-6	C.	suggest changes which would occur in the aquarium for each of the variables listed above.	Sc
4-6	D.	test the effect of each variable on the aquarium environment and record observable changes.	Sc
4-6	E.	relate the changes that occurred in the aquarium to their causes.	Sc, LA, CA
4-6	14.	choose something that has changed since pioneers came to Delaware and relate these changes to increased population.	SS, LA
4-6	15.	illustrate how a population concentration can affect the pleasures coming from a leisure-time activity (camping, hiking, sports, nature study, etc.)	SS, LA, H, CA

4-6	16.	illustrate how the population of either plants, animals or humans with a given area affect the quality of life of each organism.	SS, LA, H, Sc
4-6	17.	investigate fish sizes in various lakes, aquariums, etc., and relate to population concentrations.	LA, H, Sc
4-6	18.	debate the issue: Deer hunting is necessary to maintain a balance in wildlife areas.	SS, LA
4-6	19.	list ways overcrowded classrooms affect learning (poor air, noise, room for walking, etc.) and suggest how such problems might be overcome.	SS, LA, H, Sc
4-6	20.	construct a model which demonstrates an ecological balance among plants and animals.	SS, Sc, CA
7-9	21. A.	use media to show environmental changes resulting from overpopulation.	SS, LA, Sc, CA
7-9	B.	defend assumptions used in a presentation on overpopulation.	SS, LA, H
7-9	22.	relate population growth and human use of energy and resources to some of today's more serious environmental problems.	SS, H, Sc, LA
7-9	23.	gather and interpret data demonstrating the geometric increase of population and the arithmetic increase of food production and discuss implications.	SS, M, Sc, LA
7-9	24.	relate overcrowding to health problems.	SS, H, Sc, LA
7-9	25.	use rational argument to debate the topic: Population controls should be set by the government.	SS, H, Sc, LA
7-9	26.	debate the proposition: "The government should compensate married couples for each five years they remain childless between ages 14-49."	SS, LA, Ec

7-9	27.	predict the changes that would take place in ones family life if ones mother gave birth to triplets.	SS, H, LA, CA
7-9	28.	list and describe four practices cities should follow to cope with crowding problems.	CA, H, Sc
7-9	29.	compare the merits of highrise apartments with those of single-family dwellings in terms of quality of life and environmental impact.	SS, H, Sc
7-9	30.	discuss the psychological and physical effects resulting from crowding in large cities and identify what can be done to solve some of these problems.	SS, H, Sc, Psy, B
7-9	31.	demonstrate, using written or oral communication, how population size affects the accuracy of information transfer.	SS, LA
7-9	32.	infer from graphed data on world population growth for the past 20 centuries some resulting social and economic problems.	SS, H, M, B, Sc
7-9	33.	graph the change in population concentrations per square kilometre for this area during the past 50 years and discuss the implications if these trends continue.	SS, M, Sc
7-9	34.	A. graph the population of the earth at the beginning of each century, zero A.D. to the present.	SS, Sc, H
		B. extrapolate from current world population growth data the expected world populations for the year 2000 and 2500 and use this information to predict the future needs of his area.	SS, H, M, Sc
7-9	C.	prepare a report which evaluates present farming methods and project changes necessary to meet the needs of various predicted world populations.	SS, VA, H, LA
7-9	D.	defend land-use planning in terms of meeting future needs for all aspects of human existence.	SS, Sc, H, LA, Psy

7-9	E.	role play different national leaders solving predicted food problems.	SS, VA, H, Sc, LA, CA
7-9	35.	calculate the hectares removed from food production by urbanization.	SS, VA, M
7-9	36.	use data to compare population growth rates of under-developed, developing and developed countries.	SS, M
	A.		
	B.	list and discuss societal, cultural and family values which may account for differences observed above.	VA, SS, LA, H Ec
7-9	C.	analyze pressures upon government agencies in each of the national categories above when attempts are made to manage population growth.	SS, LA, B
7-9	D.	predict future action countries may have to take to feed, clothe and house their people.	SS, VA, Sc
7-9	37.	predict the effects of a 2 percent increase in world population would have on resources and ecosystems.	SS, H, Sc, M
7-9	38.	analyze the effect of an increasing population on wildlife.	SS, Sc
7-9	39.	use various media to demonstrate changes which would occur in nature if America's population were doubled.	LA, Sc
7-9	40.	debate the topic: "Resolved that population growth makes solution of other environmental problems of futile."	SS, H, Sc, LA
7-9	41.	discuss the feasibility of solving the earth's population problems by space migration.	SS, H, Sc
7-9	42.	indicate how experiences in the study of population can affect attitudes.	SS, Psy, LA
10-12	43.	debate the following statements:	SS, H, Sc, Psy, B, LA
	A.	"Resolved that in order to control population.	

welfare recipients should not receive allowances for child support."

- B. "Resolved that money spent on war and space exploration could be better spent on solving population and pollution problems."
- C. "Resolved that oceanic space, food and mineral resources can be used to support a doubled world population."
- D. "Resolved that increasing the industrial capability of a community will improve the quality of life of its citizens."
- E. "Resolved that the tax structure should be altered to penalize large families."

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|-------|-----|--|---------------|
| 10-12 | 44. | evaluate the following proposals: | SS, H, Sc, LA |
| | A. | "Families must limit themselves to two children." | |
| | B. | "The United States should insist on population control measures as a prerequisite for food aid to foreign countries." | |
| | C. | "The federal government should fund research on birth control." | |
| | D. | "The United Nations should develop programs to meet the needs of the world's current population growth." | |
| | E. | "Family planning centers should be developed in all communities." | |
| 10-12 | 45. | investigate population growth in the community by collecting and computing birth and death rate data. | SS, M |
| 10-12 | 46. | participate in a mock trial in which one or more persons is accused of violating Zero Population Growth requirements in the year 1984. | LA, SS |
| | A. | | |

	B.	stage a 1984 mock United Nations hearing in which one or more nations has been called into question for failing to implement Zero Population Growth.	SS, Sc, CA
10-12	C.	debate the position: "Controlled birth and death is the only way to control population."	SS, H, LA
10-12	47.	predict, based on population for the years 1850 to the present, when this planet will likely have more people than its resources can feed, clothe and shelter.	SS, H, M, Sc
10-12	48.	secure and evaluate data (both historical and current) on population trends of the community, county, state, nation and/or world.	Sc, SS
	A.		
	B.	secure and analyze data on the impact of population concentration on life styles.	Sc, SS
	C.	use the data analyzed above to develop and defend a position on the need to regulate population.	SS, Sc, LA
10-12	D.	calculate how long it will take to establish ZPG and what this stabilized population will be if a program to limit women to two children is immediately implemented.	Sc, M
	E.	evaluate various mechanisms in terms of effectiveness, usability and moral acceptability.	Sc, SS
	F.	discuss the impact of a forced ZPG on life style and value system.	H, SS, LA, B
	G.	develop a plan to communicate these findings and conclusions to various groups.	LA, SS, CA
	H.	project the effect that an increasing worldwide life expectancy of 10 years would have on a stabilized population level if population control mechanisms were to remain static.	M, Sc, SS
10-12	49.	discuss whether advancements in medical science have been a blessing to mankind.	SS, LA

10-12	50.	identify at least six environmental problems related to overpopulation and explain these relationships.	SS, H, Sc, LA
10-12	51.	use various media to depict the confrontations that would take place on a long-term spaceship voyage if the passengers did not observe ZPG policies.	LA, Sc, SS, H, CA
	A.		
	B.	relate these projected confrontations to the future of the Spaceship Earth.	SS, LA, Sc
10-12	52.	relate revolutionary activity and political unrest to crowding and validate inferred relationships by reviewing the history of armed conflict.	SS, Psy
10-12	53.	assume a future world population of 7 billion in the year 2000 and depict the effect of this population on the quality of life.	SS, LA, H, M
10-12	54.	extrapolate population and food production data to the point where the demand for food in this country and/or world will equal the supply.	SS, VA, Sc, M
10-12	55.	suggest reasons why the rate of population growth in India remained unchanged even though 1.6 million men submitted to sterilization in a single year.	SS, H, M
	A.		
10-12	B.	identify and explain new problems India may have by 1980.	SS, VA, H, Sc
	C.	prepare a report on the problems caused by population explosion in other Middle Eastern countries.	SS, H, Sc, Psy, LA
10-12	56.	list and explain ways in which the United States population affects the resources of other countries.	SS, H, Sc, Ec
10-12	57.	use various media to illustrate how individual acts, duplicated or compounded, produce significant environmental alterations.	LA, Sc, SS

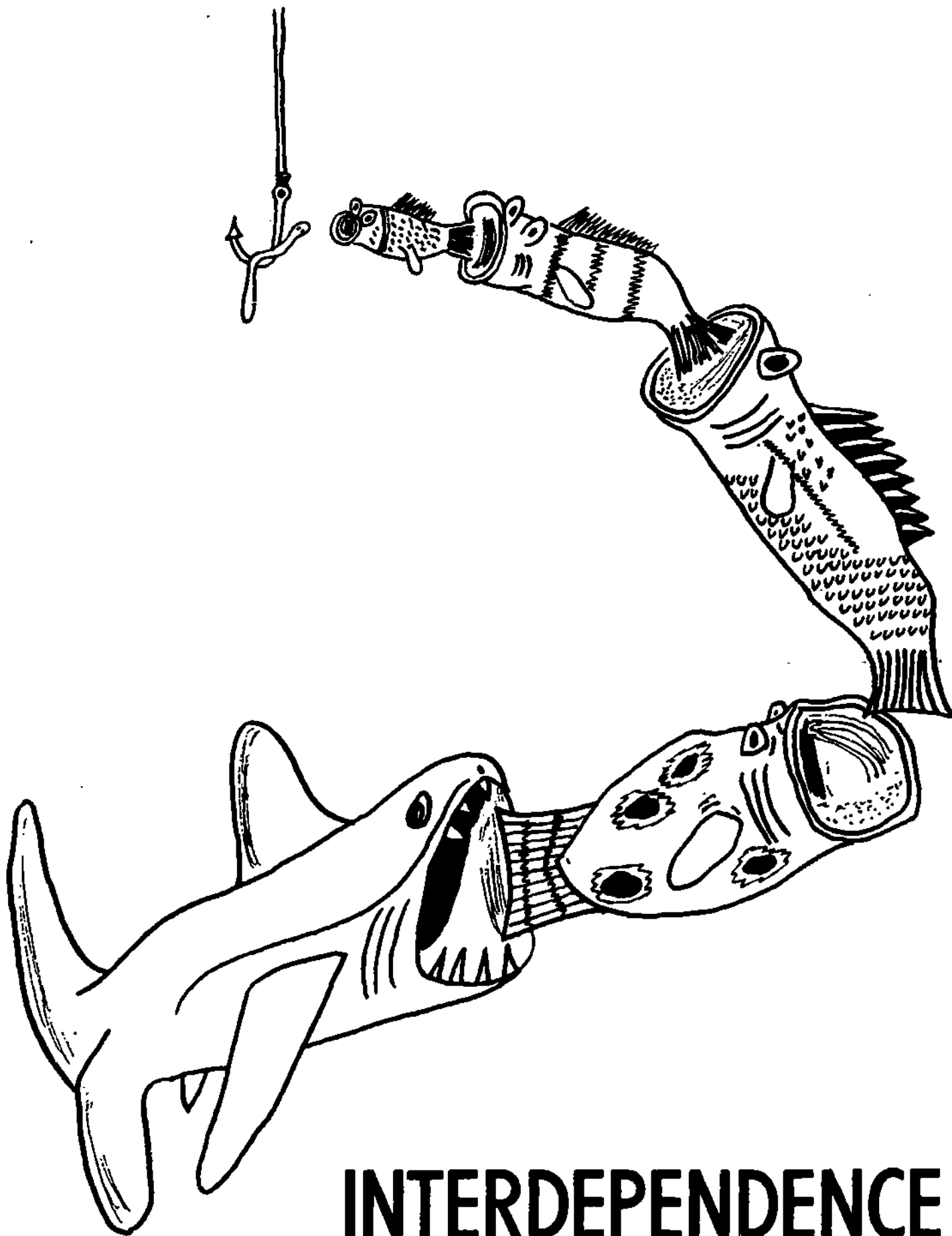
10-12	58.	evaluate the possibility of mass migration to another planet to ease the Earth's load by calculating the energy requirements for such migrations based on two or more rates of population growth.	M. Sc
10-12	59.	investigate the family planning being considered by five young married couples in the community.	SS. H

WHAT IS POPULATION EDUCATION?

Population education is defined as the process by which the student investigates and explores the nature and meaning of population processes, population characteristics, the causes of population change and, most important, the consequences of these processes, characteristics and changes for oneself, one's family, one's society and the world.

The goal of population education is to assist students to conceptualize the relevance of population for themselves, to assist them thereby to make rational and responsible individual and collective decisions about population matters, utilizing appropriate information and analytic skills. For the family, the goal can be stated as responsible fertility behavior; for the community, as rational and responsible decisions on population and public policy.

Population education is meant to educate, not to propagandize or indoctrinate. Population education views population not as a "problem" to be solved by as a "phenomenon" to be understood. The goal of understanding is to provide the intellectual underpinning for responsible action. Population education programs must also involve students in an exploration of their own values and attitudes.



INTERDEPENDENCE

GLOBAL OBJECTIVE E:

The student will demonstrate an appreciation for the interdependence of living things in the closed earth system.

Suggested G Grade Level	Instructional Objectives: Provided with the necessary activities, ex- periences, data and information, the student will:		Suggested Curriculum Areas
K-3	1.	describe how people in the community are dependent upon other communities for food, clothing and shelter, e.g., grassland communities, oceanside communities, forest communities, etc.	Sc, SS, H
K-3	2.	describe ways in which human presence in this community has produced changes from its original natural state (construction of roads, bridges, houses, businesses, factories, etc.).	Sc, SS, H
K-3	3.	compare air and/or soil temperatures recorded at the same time for classrooms, playgrounds, lawn, flower beds, wood lots and explain why these temperatures are not the same.	Sc, M
K-3	4.	correctly identify common plants found in this area that may be harmful to people such as poison ivy, poison oak, etc.	Sc
K-3	5.	identify common plants found on the school playground and develop a key to classify and identify them.	Sc
K-3	6.	identify several animals on sight or from pictures.	Sc, LA
K-3	7.	deduct from a set of animal tracks (or picture of them) what the animal was, where it came from and what it might have done.	Sc

K-3	8.	construct a terrarium.	Sc
K-3	9.	report on the needs of an animal or bird of the student's choice.	LA, Sc, CA
K-3	10.	develop and present an imaginative story telling what happened to the student as a frog when he went out to dinner.	LA, Sc, CA
K-3	11.	identify a number of birds or other small animals found in the area and describe their food and nesting requirements.	Sc, LA
K-3	12.	develop and execute a plan to improve bird and animal habitats such as building nesting boxes, establishing cover for rabbits, etc.	Sc, CA
K-3	13.	pretend to be a rabbit and explain where you would look for food, shelter and protection from enemies.	LA, Sc, CA
K-3	14.	discuss the effects that burning weedy fields and fence rows have on the nesting grounds of birds and small mammals (pheasants, quail, rabbits, meadowlarks, etc.).	Sc
K-3	15.	express in a creative play feelings about people destroying the habitats of animals.	LA, Sc
K-3	16.	compare some food chains that have been observed.	Sc, SS
K-3	17.	generate a story, play, etc., which would depict what life would be like if pigs and cows became extinct.	LA, SS, CA
K-3	18.	carry out a study to determine how homeless cats and dogs may be a problem in the community.	Sc, SS, H
K-3	19.	identify the necessities for life on a spaceship by drawing or cutting out pictures of the needed supplies.	Sc, LA, SS, CA
4-6	20.	identify some endangered species of animals and describe factors leading to their extinction.	Sc, SS, H

4-6	21.	depict in a class play a family living in harmony with the environment.	LA, SS, Sc
4-6	22.	classify ecological processes occurring locally as beneficial or detrimental.	SS, H, Sc
4-6	23.	identify major categories of human needs for support and maintenance of life.	Sc, SS
4-6	24.	record observations made about wildlife found in the neighborhood during each season of the year.	Sc, LA
	A.		
	B.	prepare a report which contains observations and conclusions formed as a result of the study.	Sc, LA
4-6	25.	give examples of simple predator-prey relationships.	Sc, SS
4-6	26.	suggest possible results of disruption in predator-prey relationships.	Sc, SS
4-6	27.	construct a food chain of a given animal and describe the effect if this chain were to be broken.	Sc, LA, SS
4-6	28.	name three wild animals commonly found in Delaware and list the major elements of a suitable habitat for each.	Sc, SS
4-6	29.	demonstrate two ways living things are interdependent.	Sc, SS, H
4-6	30.	predict the results of the addition of a new species to a balanced ecological system.	Sc, SS
4-6	31.	give examples of organisms which are harmful to humans but are helpful in maintaining a balance between living things.	Sc, H, SS
4-6	32.	construct a chart showing green plants as the basic source of human supplies for food, clothing, shelter and energy.	Sc, SS, CA
4-6	33.	discuss why pesticides must often be used even though they may be detrimental to many species of life.	SS, H, Sc

4-6	34.	develop an imaginative story of one day in the life of a plant or animal that has been observed.	LA, Sc
4-6	35.	give examples of people preserving or destroying the earth's life support systems.	Sc, H, SS
4-6	36.	describe types of natural organic decomposition and identify ways that human actions have disrupted these natural cycles.	Sc, SS
4-6	37.	construct food chains with human beings as the terminal consumer.	Sc, SS
4-6	38.	demonstrate how people are a part of the ecosystem and must live within it.	Sc, SS, H
4-6	39.	formulate a model to illustrate the finite nature of the earth system.	Sc, CA, SS, H
7-9	40.	support with data why the earth's resources, even with optimum recycling systems, can support only a limited population.	SS, Sc, H
7-9	41.	discuss why people must abandon their "use and move on" practices.	SS, Sc, H
7-9	42.	give examples of how survival of an organism depends on its ability to adjust to its environment.	Sc, SS, H
	A.		
	B.	explain how people make the most of their adaptations through the use of their intelligence.	
7-9	43.	construct food webs which contain various specified animals such as fox, hawk, mouse, salmon, shark, cow, owl, human beings.	Sc, SS
7-9	44.	trace the journey of a particle of matter through a living organism for dust to dust.	Sc, SS
7-9	45.	develop and test a hypothesis about reducing the own population in this county.	Sc, SS

7-9	46.	collect evidence showing how the "balance of nature" has become upset with the removal of a species from an eco-community.	Sc, SS
7-9	47.	illustrate how the carrying capacity of an area is determined by certain ecological factors.	Sc, SS
7-9	48.	construct various microhabitats and test their carrying capacity in terms of a given species.	Sc, SS
7-9	49.	evaluate the truth of the position: the interdependence of animals and plants provides a balance between living things on Earth and does not allow overpopulation.	Sc, SS
7-9	50.	diagram the interrelationships of animals and plants in the community and report how daily activities affect this interdependency.	Sc, SS, H
7-9	51.	explain the complexities of an ecological problem within a given ecosystem.	Sc, SS, H, LA
7-9	52.	identify an ecological problem in the community and design a program to correct it.	SS, Sc, H
7-9	53.	report on an overloaded system the student has observed.	LA, Sc, H
7-9	54.	formulate a hypothesis about how changed environmental practices may affect the ecological balance.	SS, Sc, H
7-9	55.	discuss how the manipulation of one environmental element affects all elements.	SS, Sc, H
7-9	56.	identify how the CO ₂ -O ₂ (carbon dioxide-oxygen) cycle is affected by family, industry and citizens in the community and discuss what one can do to improve the CO ₂ -O ₂ cycle.	SS, Sc, H
7-9	57.	suggest ways to guard against detrimental environmental manipulations of ecosystems.	Sc, H, LA, SS
7-9	58.	identify industrial practices which minimize detrimental impacts on the environment.	SS, Sc, H, I.A.

7-9	59.	gather, interpret and disseminate information concerning the effects of chemicals (pesticides, phosphates, etc.) on functioning ecosystems.	Sc, LA, H, VA
7-9	60.	design an experiment to investigate the effect of detergents on fish.	Sc, H
7-9	61.	collect data to illustrate the change in algae species that result from increased detergent use.	Sc, H, SS
7-9	62.	hypothesize about ecological problems resulting from the destruction of a marsh.	Sc, SS, H
7-9	63.	brainstorm and contribute to a list of ideas on the question: How can people live in harmony with nature in the 20th and/or 21st century?	LA, SS, Sc, H
7-9	64.	construct a model of a watershed which shows how living organism interact with each other and their environment.	SS, Sc, LA, H, CA
7-9	65.	develop a satirical television presentation highlighting the concept that an area can support only a limited number of organisms.	Sc, LA, SS, H, CA
7-9	66.	develop a compost pile.	Sc, VA, HE
	A.		
	B.	observe and report on the natural processes occurring in a compost pile.	Sc, VA, LA
	C.	relate composting to maintaining an environmental quality.	Sc, VA, H Ec
7-9	67.	observe and describe the natural and ecological beauty of a pond and discuss life styles needed to preserve its delicate balance.	LA, SS, Sc, CA
7-9	68.	portray through media the natural and ecological beauty of a river and discuss life styles needed to preserve its ecological function.	LA, SS, Sc, CA
7-9	69.	construct an operational definition of a closed system after gathering data concerning the needs and limitations imposed on a spaceship crew during a trip to Mars.	Sc, H, SS, LA
	A.		

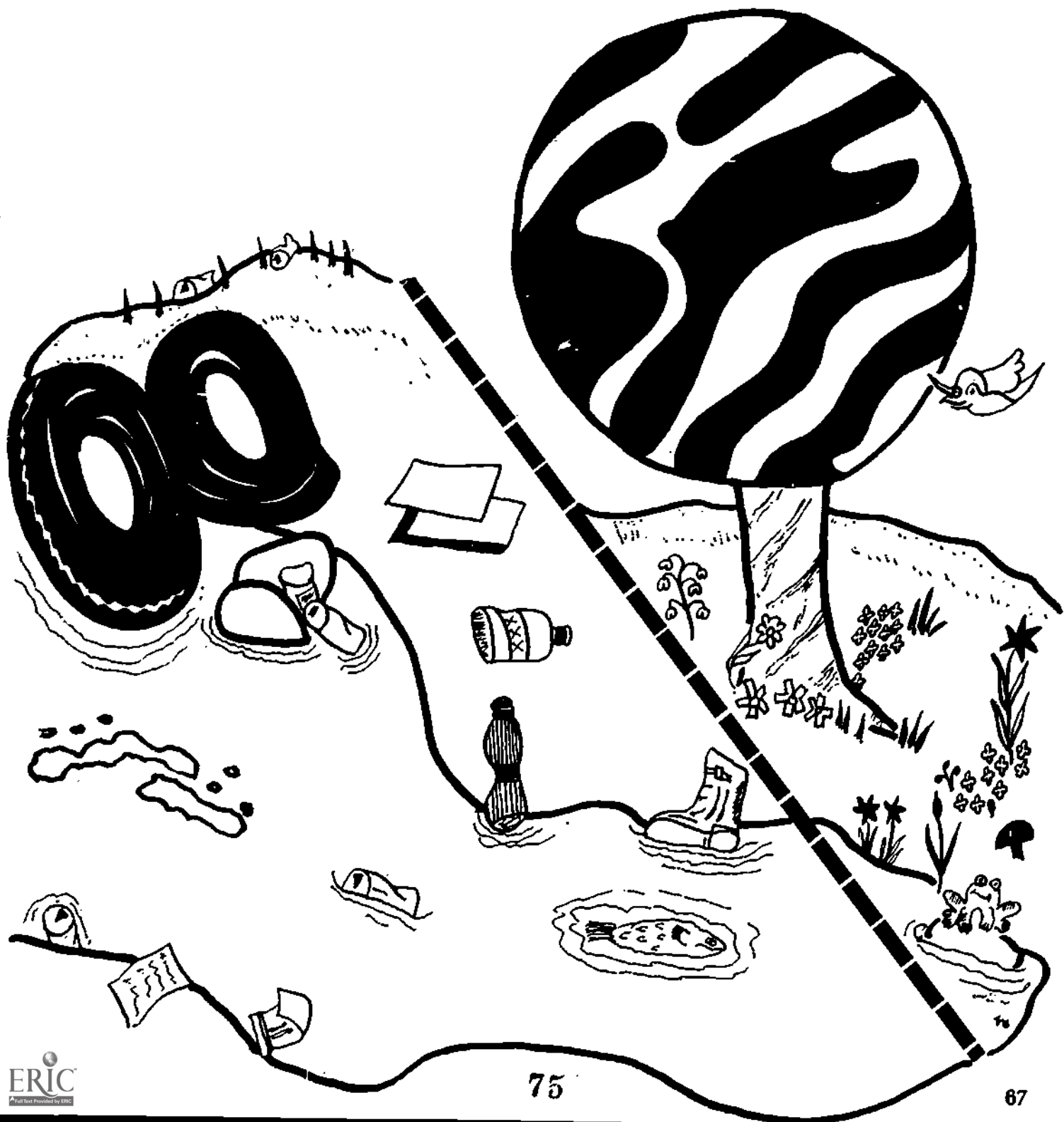
	B.	write and produce a drama which depicts an extended voyage through space in a closed spaceship system.	LA, Sc, SS, H, CA
	C.	describe plant-animal interdependence within a spaceship during a flight to a near star.	Sc, SS, LA, H
10-12	70.	defend reasons for advocating certain social and/or governmental controls which limits the people's freedom in determining their own life style.	Sc, SS
10-12	71.	develop a documentary media presentation showing the dependence of all living things on pure water.	Sc, H, CA, SS
10-12	72.	observe and report on the natural steps which occur in lakes, rivers, etc., to decompose waste.	Sc, H, CA, SS
10-12	73.	provide ecological reasons why species of fish once in Lake Erie are no longer there.	Sc, H, SS
10-12	74.	collect data and chart changes of a local pond, lake or river over an extended period of time.	Sc, SS, M
10-12	75.	evaluate the environmental impacts that have resulted from the draining of marshes which once covered much of Kent, Sussex and New Castle Counties.	Sc, SS, B, VA
10-12	76.	describe one cause and effect relationship which occurs as a result of human attempts to exterminate predators.	Sc, LA
10-12	77.	debate the validity of the premise: "The history of people is the history of their growing mastery over nature."	Sc, LA, SS
10-12	78.	discuss the hypothesis: "The biosphere, as it occurs on earth, is a single macro-organism."	Sc
10-12	79.	draw, or describe, a food chain which shows how animals collect insecticides, pesticides, etc., in their bodies.	Sc, LA, H, VA

10-12	80.	propose action to remove harmful insecticides and pesticides from the market.	Sc, VA, H, B, SS
10-12	81.	report on research being done to prevent future products from being marketed until adequate testing data proves them safe.	Sc, SS, B
10-12	82.	offer alternatives to the use of insecticides for insect control.	Sc, VA
10-12	83.	predict the future of people if they continue to pollute the environment with pesticides.	Sc, H, VA, SS
10-12	84.	select an article from a popular periodical (or newspaper) dealing with environmental problems and analyze cause and effect relationships stated in it as to whether these relationships are observations, substantiated conclusions based on observations, supportable hypotheses or merely inferences of the author.	LA, Sc, SS
10-12	85.	tape a radio or television program dealing with the environment and analyze cause and effect relationships presented in it as to whether these relationships are observations, substantiated conclusions based on observations, supportable hypothesis or merely inferences of the author.	LA, Sc, SS
10-12	86.	select an isolated biological community and	Sc
	A.	analyze it in terms of identifying all possible ecological relationships between individual organisms and species within it.	
	B.	analyze the above biological communities in terms of any natural ecological success that is occurring within it.	Sc
10-12	C.	further investigate this biological community to identify any imports and exports (including animal migration) of energy and matter occurring.	Sc
	D.	impose a hypothetical change upon this biological community (such as a sudden	Sc, SS

change in the population or habits of one native species, temperature, rainfall or the introduction of foreign matter or species) and trace the ecological disturbances that would occur in the community.

- | | | | |
|-------|-----|---|----------------|
| 10-12 | E. | use the model developed in the four objectives above to formulate a model for the closed earth system. | Sc, SS, H |
| | F. | analyze and project the impact of various human activities upon the model earth system. | |
| | G. | use various communicative techniques and art forms to present ecological problems have been investigated in the six above objectives. | LA, CA, SS, Sc |
| 10-12 | 87. | select a specific natural resource available to another country (uranium ore in Mainland China, oil in the Middle East, caviar in Russia, sugar in Cuba, etc.) and discuss the various impacts of this supply on our lives. | SS |
| | A. | discuss the political, economical, historical and cultural implications of the world distribution of various natural resources. | SS, B, LA B. |
| 10-12 | 88. | select a proposed local construction project and carry out the environmental impact study. | SS, Sc |
| | A. | secure a copy of an environmental impact study that has been submitted to the Environmental Protection Agency or the Delaware Department of Natural Resources and evaluate its adequacy. | SS, Sc |

QUALITY OF LIFE



GLOBAL OBJECTIVE F:

The student will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for himself, society and the environment.

Suggested Grade Level	Instructional Objectives:		Suggested Curriculum Areas
	Provided with the necessary activities, ex- periences, data and information, the student will:		
K-3	1.	demonstrate by group and individual action that classmates' rights must be respected.	SS
K-3	2.	show by behavior that private ownership is respected.	SS
K-3	3.	explain why one feels the basic needs of life should also include truth, beauty, justice, love and faith. (Give examples of how each person may contribute to each of the above.)	SS, Sc
K-3	4.	give examples of situations in the home or community which provide comfort for various members of the family.	SS, Sc
K-3	5.	differentiate between housing in the com- munity which seems to be adequate and housing which is not.	SS, Sc
K-3	6.	develop individual, class or "action" projects that will improve the community environment. Some suggestions include: anti-litter drives, using both sides of a piece of paper, a classroom flower garden, picking up trash along the street, etc.	SS, Sc, CA, LA
K-3	7.	"plan" a community which provides for homes, work, food, water, waste disposal, etc., using a sand table, diagram, or bulletin board.	Sc, CA, SS, H

K-3	8.	show, through dramatization by puppets, the results of careless planning of a classroom, school or community.	LA, SS, H, CA
K-3	9.	differentiate between good or bad land use from pictures or experiences.	LA, SS
K-3	10.	suggest ways to better care for land in his community.	SS, Sc, H
K-3	11.	suggest reasons wildflowers should be preserved for others to enjoy.	CA, SS, Sc
K-3	12.	list and discuss sounds which the student likes or dislikes.	Sc, H, CA
4-6	13.	observe people in crowded situations and report how their behavior changes.	SS, Sc, H
4-6	14.	suggest ways local people may be influenced to more completely appreciate and protect their environment.	SS, Sc
4-6	15.	plan and promote ways to develop individual and community spirit in highly polluted areas.	SS, H
4-6	16.	demonstrate the difference between the needs of people and their wants that are not essential to life by dramatization, role playing, etc.	Sc, H, LA, SS, CA
4-6	17.	observe and identify types of pollution that affect the quality of life.	Sc, SS H
4-6	18.	identify noise pollution sources in the school community.	SS, H, Sc, CA
4-6	19.	group sounds from several locations as natural and human-made, pleasant or unpleasant.	Sc, H, CA
4-6	20.	discuss the results noise pollution may have on people if it is not controlled.	SS, H, CA
4-6	21.	demonstrate ways noise interferes with learning ability.	Sc, SS, H
4-6	22.	design and demonstrate a system for measuring the intensity of sound.	Sc, H, CA

4-6	23.	propose feasible solutions to noise pollution problems in the community.	Sc, H, SS
4-6	24.	observe and describe the steps that are necessary to produce potable water at the faucet in the home.	Sc, SS, H
4-6	25.	give examples of how technology and proper management have restored land.	Sc, SS
4-6	26.	commend those responsible for improving environmental quality. (Techniques: poetry, letters, songs, stories, individual actions.)	LA, CA
4-6	27.	describe how highways affect the use of land and discuss the aesthetic, economic and other effects of such changes.	LA, SS, Sc
4-6	28.	develop a transportation plan for the community to alleviate many of its pollution and safety problems.	SS, H
4-6	29.	identify recreation areas in the community which may soon be unusable because of improper use, development, size or contamination.	H, Sc, SS
4-6	30.	identify local practices which affect the beauty of the community.	Sc, SS, H
4-6	31.	explain why beauty and recreation are important in human leisure time activities.	SS, H, Sc, CA
4-6	32.	develop a photographic essay to show how people have capitalized on nature's beauty.	LA, CA
4-6	33.	give examples of steps which might be taken to prevent or minimize pollution by some of the following: self, family, neighborhood, industry, towns, cities, counties, states, federal government, United Nations, nations of the world.	Sc, SS, H, B
4-6	34.	list the uses and abuses of natural resources observed during a recent field trip.	LA, H, Sc, SS

4-6	35.	survey the community to determine attitudes of individuals, farmers, businessmen or others about pollution control.	SS, H, Sc, B
4-6	36.	discuss reasons why laws have been established to reduce pollution, protect wildlife, protect flowers, etc.	SS, H, Sc
4-6	37.	discuss whether new laws, a concerned citizenry and new technology will enable man to maintain a livable environment.	H, SS, Sc, B
4-6	38.	write a dialog or play to illustrate how culture affects values and attitudes about the environment using examples such as frontiersmen, Indians, farmers, city dwellers, etc.	LA, SS, CA
7-9	39.	observe and report on persons who promote love, comfort, understanding and a positive self-concept.	SS, Sc, CA
7-9	40.	investigate factors influencing human's attitude toward the environment and explain how people express these attitudes through many forms of communication. (Consider verbal and nonverbal.)	SS, LA, CA
7-9	41.	observe and report on ways in which actions have affected or violated the rights of others.	LA, SS, Sc, B
7-9	42.	evaluate local community zoning regulations in terms of their effects on the quality of life.	SS, H, B
7-9	43.	react to the following situation: A person with a small farm on the edge of town cannot raise enough food to feed cows and cannot buy more land. What should be done and why?	Sc, SS, B
7-9	44.	discuss environmental conditions which encourage people to improve their lives.	SS, H, B
7-9	45.	predict future living problems in large cities if long-range planning does not provide adequately for the humanistic needs of all people.	SS, H, Sc, LA, CA

7-9	46.	propose a flexible plan for community development which provides for human needs.	SS, H, Sc, B
7-9	47.	write and present a program illustrating how continuance of present human life styles will affect the quality of life.	SS, H, Sc, LA, B
7-9	48.	describe the adequacy of emission controls (smoke, fumes, solids, liquids) at one community industrial site based on data obtained by systematic observation.	SS, Sc, H
7-9	49.	present data on how industrialization may both positively or negatively affect areas.	SS, H, B
7-9	50.	inventory community recreational activities and predict the future of each based upon current environmental practices. (Example: polluted lakes, misused parks, local population trends, etc.)	SS, H, B, Sc
7-9	51.	discuss whether science, law, technology and money will be able to solve environmental problems without also changing people's values and attitudes.	SS, H, Sc, B
7-9	52.	propose and implement a system for recognizing businesses which employ good environmental practices.	LA, B
7-9	53.	calculate water yield and water consumption for the county and relate this to projected water needs.	H, M, Sc, SS, B
7-9	54.	compare the quality of local surface water with rain water.	H, Sc
7-9	55.	identify problems resulting from intensified agricultural production such as feed lots and enriched fertilizer.	VA, H, Sc
7-9	56.	observe various types of flood plain usage and differentiate between good and poor uses.	SS, VA, H, Sc, B
7-9	57.	relate land drainage practices to water supply, wildlife needs and CO ₂ -O ₂ balance in the atmosphere.	Sc, VA, H

7-9	58.	identify factors which cause lake eutrophication and suggest practices which will slow the process.	SS, Sc, H, VA
7-9	59.	compare the organisms living in fresh bodies of water with those in water undergoing eutrophication.	Sc, H
7-9	60.	conduct a study to determine the environmental impact of power boats on a body of water.	SS, H, Sc
7-9	61.	research environmental implications of using colored paper products.	H, Sc
7-9	62.	evaluate the adequacy of the local sewage treatment facility.	SS, Sc, H
7-9	63.	calculate the cost (per user) of adding tertiary sewage treatment for a nearby city and debate a resolution for such installation.	M, H, B
7-9	64.	discuss current federal, state and local laws which affect the community's method of sewage treatment.	Sc, SS, H, B
7-9	65.	discuss economic and ecological reasons for future utilization of sea water.	SS, Sc, H, B
7-9	66.	analyze the merits of various modes of transportation that might be used in an urban area and propose a transportation plan for his community.	SS, B, Sc
7-9	67.	debate the resolution: "Billboard signs should be banned."	CA, LA
7-9	68.	evaluate "environmentalists" demand for antipollution devices in automobiles.	SS, H
7-9	69.	test a plant's ability to grow in polluted air such as near a factory or traffic congested area.	Sc
7-9	70.	gather data about respiratory illnesses in the area and state a hypothesis about the cause of respiratory problems.	H, Sc

7-9	71.	design a land use plan for the town or community which will maximize the quality of life.	SS, CA
7-9	72.	choose an occupation of interest and write a brief report explaining this choice and its potential relation to the quality of life.	SS, LA
7-9	73.	express opinions, using various media, on how increased leisure time has influenced change in land use in his community, county or state.	LA, SS, Sc, H, CA
7-9	74.	evaluate five new products seen advertised recently on television in terms of their potential impact on the environment.	LA, B
7-9	75.	describe problems which may occur if a community of 3,000 were to grow rapidly to 50,000 without land use planning.	H, Sc, LA, SS
7-9	76.	list and evaluate four government activities aimed at improving health.	SS, Sc, H
7-9	77.	describe life styles which the student feels are ecologically sound.	SS, Sc, LA
7-9	78.	evaluate the merits of the statement: "Bigger is not necessarily better, slower can be faster, and less can be more."	SS, B, LA
7-9	79.	identify animals which have adapted and proliferated as a result of urbanization.	Sc, SS
7-9	80.	use an art form to depict leisure time activities which contribute to environmental stresses.	CA, SS
10-12	81.	prepare a presentation depicting the life of young people and adults from another segment of society.	LA, SS, CA
10-12	82.	report on psychological and sociological stresses in urban areas.	H, Sc, SS, Psy
	A.		
	B.	report on the advantages of living in metropolitan centers.	H, Sc, SS, Psy
	C.	prepare a report suggesting ways to improve the quality of life in urban areas.	SS, Sc, H, LA, Psy

10-12	83.	evaluate various fashions and modes of dress in terms of their environmental impact, e.g., recycling of materials, energy used in production, heating and ventilation of building, etc.; write a dress code for school which is practical, ecological and implementable.	H Ec, SS, H, Sc
10-12	84.	identify and explain the conditions in the community which have affected its productivity and/or livability.	H, SS, Sc, Psy
10-12	85.	gather data which shows that the availability of natural resources greatly affects the quality of life.	Sc, H, SS
10-12	86.	develop a presentation describing what the community would be like with the removal of one resource.	LA, H, SS, Sc
10-12	87.	prepare an editorial about a community problem.	LA, SS, H, CA
10-12	88.	research and prepare a movie or videotape which explains a local ecological problem.	LA, Sc, H, CA
10-12	89.	develop a display or other presentation which depicts life style changes in the community during this century.	LA, SS, CA
10-12	90.	analyze and report on societal factors which affect attitudes and values.	LA, SS, CA
10-12	91.	design a program to correct a local environmental problem.	SS, H, Sc, LA, CA
10-12	92.	assess zoning regulations in terms of environmental considerations.	SS, H, B, VA
10-12	93.	develop an inventory and construct a map of a downtown area showing rivers, parks, wildlife areas, aesthetic areas, trees and other interesting natural features.	CA, SS
10-12	94. A.	survey the community to determine usage of local parks.	H, PE, SS, LA
	B.	suggest a plan for improving the quality of park utilization.	H, PE, SS CA, LA

10-12	95.	collect data on human behavior relevant to the solution of a city's traffic problems.	SS, H, Sc, Psy
10-12	96.	design a restoration plan for a city based on humanistic considerations.	SS, CA, LA, H, Psy
10-12	97.	prepare a traffic plan for the city which provides for the reduction of problems of traffic, noise, parking, etc.	SS, H, CA, LA
10-12	98.	suggest ways shopping center parking lots can be constructed to better utilize the natural environment.	SS, CA, B
10-12	99.	plan an audiovisual experience depicting various (visual) aesthetic characteristics of the community.	CA, SS, LA
	A.		
	B.	suggest a plan for improving or maintaining the aesthetics of the community.	CA, LA, SS, Sc
10-12	100.	develop a documentary on the necessity of including environmental impact consideration in making all public and/or private decisions.	SS, H, CA, LA, Sc
10-12	101.	react objectively to: "A country must constantly increase its Gross National Product to prosper."	B, SS, LA
10-12	102.	identify a business or industry which employs a large number of people but whose operation causes considerable damage to the local and/or downstream - downwind environment.	SS, H, B, Sc
	A.		
	B.	prepare a report outlining the economic, political and ethical considerations which the board of directors of the above organization must evaluate in arriving at a decision to either close the plant or massively invest in additional pollution control devices.	SS, H, B, LA
10-12	103.	debate the issue: "An industrial company should voluntarily install pollution control devices in the absence of industry-wide regulations or agreements on emission levels."	B, Sc, H, SS, LA

10-12	104.	formulate a plan for the location and construction of needed major industries, utilities or public installations in the community.	SS, H, B, CA, Sc, LA
	A.		
	B.	develop an adequate environmental impact study for one of the installations.	SS, H, B, Sc, LA
10-12	105.	secure a copy of an environmental impact study that has been submitted to the Environmental Protection Agency and evaluate its completeness.	SS, Sc
10-12	106.	assess the environmental impact practices of local, state and federal highway agencies.	SS, H, Sc, CA
10-12	107.	select a nearby construction project (highway, houses, school, etc.) and determine whether the contractor and/or developer is adequately providing for the maintenance of the environment during the period of construction.	SS, B, Sc
10-12	108.	identify roles which governments, institutions, and organizations can logically assume in repairing environmental damages.	SS, H, B
10-12	109.	debate the issue: "The solution of environmental problems is the sole responsibility of science and technology."	B, LA, SS, Sc
10-12	110.	project the effect of proposed nuclear power plants on water quality and usage if construction plans do not include thermal and pollution control devices.	H, SS, Sc, M
10-12	111.	explain the economic, health and ecological implications of such city practices as street flushing, salting, etc.	H, SS, Sc
10-12	112.	identify problems resulting from chemical, insect and weed control.	VA, H, SS, Sc
	A.		
	B.	suggest workable alternatives to chemical controls which will provide for an adequate food supply.	VA, H, Sc, B

10-12	113	map and explain why the development and location of America's largest cities depend on an adequate supply of usable water.	SS, H, B
10-12	114.	predict the future of all forms of life if the nation's waters are increasingly polluted by an increasing population and water treatment does not keep pace with the population's demand for water.	H, SS, Sc
10-12	115.	compare dollars needed for cleaning up waterways to the current local, state and federal appropriations and assess which components of these funds need to be increased.	SS, H, Sc, B
10-12	116.	list effects of polluted air on life.	SS, H, B
10-12	117.	relate the "Green House" effect to weather change.	Sc, H
10-12	118.	document that air pollution is a direct effect of industrialization in developing societies.	B, H, SS
10-12	119.	construct the conditional situation which would encourage industries and utilities to improve their air quality.	SS, B
10-12	120.	acquire and study current air pollution legislation.	SS, H, Sc, B
10-12	121.	analyze and report on the environmental trade-off involved in the nitrogen cycle, e.g., consider providing adequate protein diets vs water nitrification.	VA, Sc, H, SS, H Ec
10-12	122.	secure and test foods for insecticide or pesticide contamination.	Sc, H, H Ec, VA
10-12	123.	contrast an early colonist's value system with that of ours today in terms of land and resource use.	SS, VA, B, CA
10-12	124.	investigate religious and non-religious historical figures to discover the effects of religion on human attitudes and values toward the environment.	SS, LA

10-12	125.	interpret personal feelings toward mankind and the environment by means of a collage, poem or skit.	LA, Sc, SS, CA
10-12	126.	write a paper describing relationships between a human cultural, social or economic experiences and his attitudes and values toward the environment.	LA, SS, B
10-12	127.	give examples of short-term gains that may well become long-term losses.	SS, B
10-12	128.	write a paper or give a speech illustrating the environmental ramifications of Pogo's statement: "We have met the enemy and he is us."	SS, LA, H, Sc
10-12	129.	evaluate various life styles and value systems existing in his community, nation and the world in terms of providing optimum short-term and long-term benefits for himself, society and the environment.	YOUR CHOICE

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